Nokia Customer Care

Service Manual

RM-43 (Nokia N91)
Mobile Terminal
Part No: 9250023 (Issue 1)

COMPANY CONFIDENTIAL

NOKIA

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
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IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- During testing never activate the GSM transmitter without a proper antenna load, otherwise the GSM PA may be damaged.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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- Title of the Document + Issue Number/Date of publication
- Latest Amendment Number (if applicable)
- Page(s) and/or Figure(s) in error

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Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Nokia N91 Service Manual Structure

1 General Information
2 Parts Lists and Component Layouts
3 Phoenix Service Software Instructions for BB5
4 Service Tools and Service Concepts
5 Disassembly/Reassembly Instructions
6 BB Troubleshooting and Tuning Guide
7 RF Troubleshooting and Tuning Guide
8 Camera Module Troubleshooting
9 System Module
10 Schematics

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1 — General Information

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Table of Contents

Product selection....1–5
Product features and sales package....1–5
Mobile enhancements....1–7
Technical specifications....1–9
  Transceiver general specifications....1–9
  Main RF characteristics for triple-band (EGSM900/GSM1800/GSM1900) and WCDMA phones....1–9
  Battery endurance....1–10
  Environmental conditions....1–10

List of Tables

Table 1 New enhancements....1–7
Table 2 Audio....1–8
Table 3 Car....1–8
Table 4 Carrying....1–8
Table 5 Data....1–8
Table 6 Messaging....1–8
Table 7 Power....1–8
Table 8 Compatible enhancements....1–9
Table 9 Upcoming compatible enhancements....1–9

List of Figures

Figure 1 Product view....1–5

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Product selection

Nokia RM-43 is a WCDMA/GSM dual mode handportable phone, supporting WCDMA 2100 (UMTS) and EGSM 900/1800/1900 bands.

According to GSM standard 3GPP TS 51.010-2 V6.5.0(2005-11) it responds to class 4 (max. 2W) in EGSM 900, class 1 (1W) in GSM 1800 and class 1 in GSM 1900. RM-43 supports EGPRS (EDGE) class B , Bluetooth 1.2 standard, WLAN 802.11b/g/i, and USB2.0 full speed with mass storage profile. The handset has a full phase 2 Type Approval and it complies with the GSM Type Approval. RM-43 also has full CE and FCC approvals.

The device is equipped with a 4 GB hard drive. It is an MMS (Multimedia Messaging Service) enabled phone with a large bright colour display and an integrated 2.0 megapixel camera.

The MMS implementation follows the OMA MMS standard release 1.2.

The WAP 2.0 compatible browser supports XHTML Mobile Profile (MP) and uses a TCP/IP stack to communicate with a gateway in network.

The device uses Symbian 8.0a operating system and supports also MIDP Java 2.0 & CLDC1.1, providing a good platform for 3rd party applications.

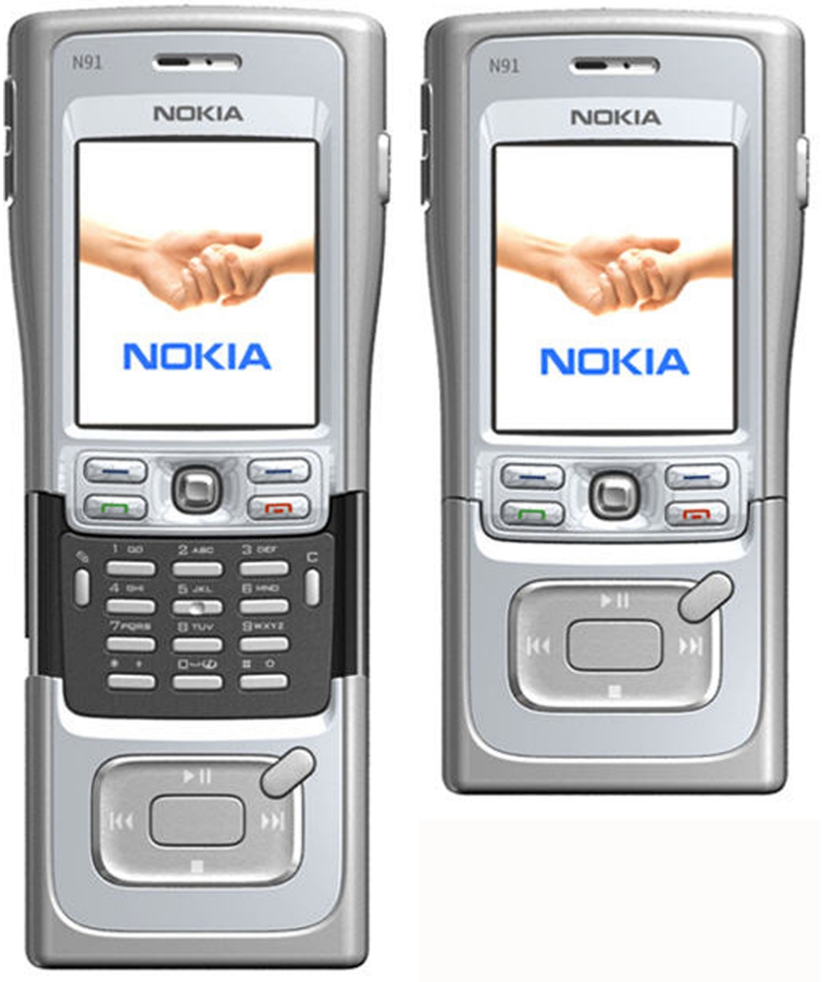

Figure 1 Product view

Product features and sales package

Display and keypad features

- Active matrix colour display (176 x 208, 262k colour)

- Music keys: Play/pause, forward, back, stop, music access key
- Keys: Two softkeys, Send & End, 5-way navigator, S60 keys (Application, Edit, Clear), ITU-T keypad, Volume (up & down), Power, lock switch

Hardware characteristics

- Dual-mode: EGSM900/1800/1900 MHz, WCDMA 2 GHz
- WCDMA PS max. speeds UL/DL: 128/384 kbps. WCDMA CS UL: 64 kpbs.
- Monoblock slider with metal covers
- EGPRS, class B, multislot class 10, UL/DL: 118.4/236.8 kbps, GPRS class B, multislot class 10.
- Speech codecs: FR, HR, EFR, AMR
- Bluetooth v1.2
- WLAN 802.11b/g/i
- USB 2.0 Full Speed with Mass Storage Profile
- Bluetooth profiles supported: L2CAP, SDP, RFCOMM, SAP, DUN, FAX, OPP, FTP, HFP, GOEP, GAP, SPP, HSP, BIP
- 4 GB Hard-Disk Drive
- 3.5 mm stereo headphone jack supporting music/voice remote control
- 3.5 mm standard headphones for listening to music. The headset has an internal antenna for FM radio
- 2 Megapixel camera
- Mini-USB connector (mini to standard)
- Internal handsfree speaker, Internal vibra

Software and UI features

- Dual Transfer Mode (DTM), Class 9 in GSM networks to support simultaneous voice and packet data
- Music player
  - Codecs: MP3, AAC, AAC LC, AAC LTP, AAC+, eAAC+, Real, WMA, M4A, AMR-NB, AMR-WB, WAV,
  - Enhanced playlist and music file management
  - Audio effects (8-band equalizer, stereo widening, loudness, balance)
  - OMA DRM 2.0
- Music synchronization with USB Mass Storage
- FM radio with Visual Radio functionality
- Ringing tones supported: RNG, MID, AWB, and supported formats except Real formats
- Video streaming and capture
  - Codecs: H.263 Profile 0, Level 10; MPEG4 Visual simple Profile 0, 3; Real Video
- Image viewers
  - Codecs: JPEG, GIF, BMP, PNG, EXIF
- Advanced camera modes: still, burst, video and options for night, brightness adjustment, image quality, self-timer
- Digital zoom up to 20x
- SMS, MMS (OMA 1.2), IM 1.2, E-mail (POP3/IMAP4)
- Browser (XHTML MP 1.1, ESMP, Plugin API, File Upload, XHTML MP, WAP CSS, HTML 4.01, WML 1.3, JavaScript, WMLSript, WBMP, vCalendar, vCard, HTTP, WAP Push)
- Offline mode and SIM-less operation

- S60 PIM (calendar, contacts, task list, etc.)
- PC Suite v.6.7.22 support
- Voice dialling and voice commands
- SIND (Speaker Independent Name Dialling)
- Nokia PoC (Push-over-Cellular)
- Java: CLDC 1.1 (JSR-139); MIDP 2.0 (JSR-118); JTWI 1.0 (JSR-185); supported JSRs: 82, 75, 184, 179, 172, 177, 180, Wireless Messaging API 2.0 (JSR-205): Mobile Media API (JSR-135); and Nokia UI API
- Start up wizard for easy configuration

Sales package

Note: The sales package content may vary depending on region/country or operator.

- Transceiver
- HS-28 stereo headset (with remote control AD-36)
- BL-5C Li-ion battery
- DT-10 deskstand
- DKE-2 connectivity cable (USB)
- CA-44 cable charger adapter
- AC-4 travel charger
- User guide, Quick start guide, and application leaflet
- CD-ROM (with PC Suite and other applications)

Mobile enhancements

Table 1 New enhancements

Marketing name	Type designator
3.5 mm stereo headphones	HS-28
Remote control	AD-36
Deskstand	DT-10
Nokia audio cable	CA-72U
Stereo speakers	n/a
Travel speakers	n/a
Wireless headset	HDW-2
Wireless clip-on headset	HS-3W
Wireless stereo headset	HS-12W
Wireless image headset	HS-13W
Wireless clip-on headset	HS-21W
Premium wireless headset	HS-24W
Classic wireless headset	HS-25W
Desk stand	DT-10

Table 2 Audio

Marketing name	Type designator
Wireless headset	HDW-3
Wireless boom headset	HS-4W
Wireless headset	HS-11W
Basic wireless headset	HS-26W
Wireless headset	HS-36W
Wireless headset	HS-37W

Table 3 Car

Marketing name	Type designator
Car kit phone	N616
Wireless car kit	CK-1W
Advanced car kit	CK-7W
Plug-in car handsfree	HF-6W
Universal holder	CR-39

Table 4 Carrying

Marketing name	Type designator
Carrying case	n/a

Table 5 Data

Marketing name	Type designator
Connectivity cable	DKE-2

Table 6 Messaging

Marketing name	Type designator
Digital pen	SU-1B

Table 7 Power

Marketing name	Type designator
Battery 970 mAh Li-ion	BL-5C
Compact charger	AC-3
Mobile charger	DC-4
Travel charger	AC-4

Marketing name	Type designator
Charger adapter	CA-44

Table 8 Compatible enhancements

Marketing name	Type designator
Sputnik, browsing pad	n/a
Nokia remote camera	PT-6
Image album	PD-1
Wireless image headset	HS-13W
Wireless GPS module	LD-1W
Wireless carkit	CARK112
Image viewer	SU-2
Wireless headset	HDW-2
Wireless clip-on headset	HS-3W
Fitness monitor	LS-2

Table 9 Upcoming compatible enhancements

Marketing name	Type designator
Wireless headset	HS-25W
Wireless headset	HS-24W

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T) (mm)	Weight (g)	Volume (cm3)
Transceiver with BL-5C 970 mAh li-ion battery back	55.2 x 113.1 x 22	164	108 cc

Main RF characteristics for triple-band (EGSM900/GSM1800/GSM1900) and WCDMA phones

Parameter	Unit
Cellular system	EGSM900, GSM1800/1900 and WCDMA
Rx frequency band	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA: 2110 - 2170 MHz

Parameter	Unit
Tx frequency band	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA: 1920 - 1980 MHz
Output power	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA -50 ... 24 dBm
Number of RF channels	GSM900: 125
	GSM1800: 375
	GSM1900: 300
	WCDMA: 277
Channel spacing	200 kHz
Number of Tx power levels	GSM900: 15
	GSM1800: 16
	GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by	Browse time	MP3 play time	Radio play time
BL-5C	970	GSM up to 3-4 hrs and WCDMA up to 2.5 - 3 hrs	GSM up to 190 hrs WCDMA up to 170 hrs	Up to 2 h	up to 10 h	up to 10 h

Charging times

AC-4
less than 2 h

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only

Environmental condition	Ambient temperature	Notes
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

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2 — Parts Lists and Component Layouts

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Table of Contents

Exploded view....2–5
Spare parts overview....2–6
Parts lists....2–7
    Mechanical spare parts list....2–7
    Component parts list (1jy_21a)....2–9
Component layouts....2–52
    Component layout - bottom (1jy_21a)....2–52
    Component layout - top (1jy_21a)....2–53

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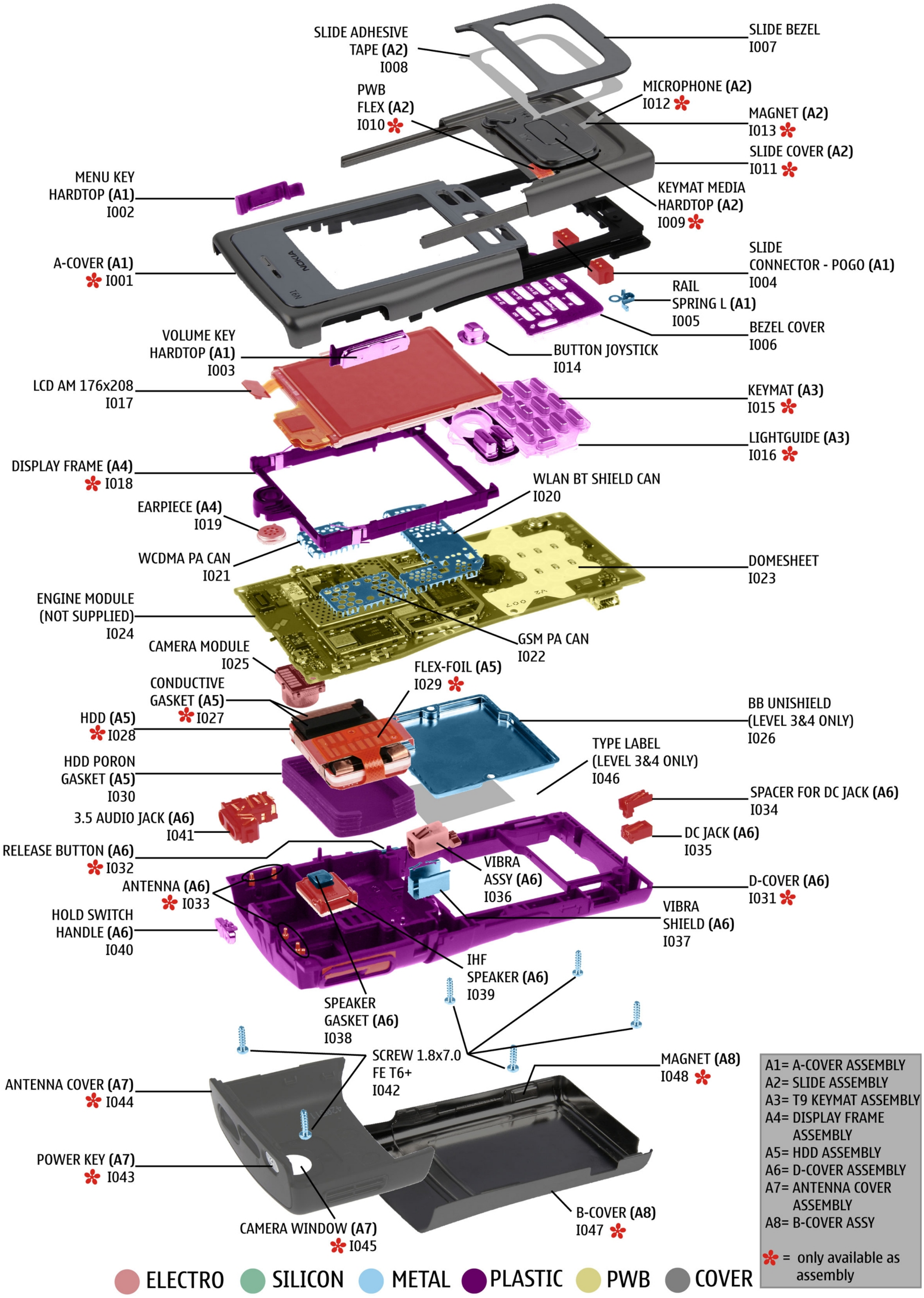
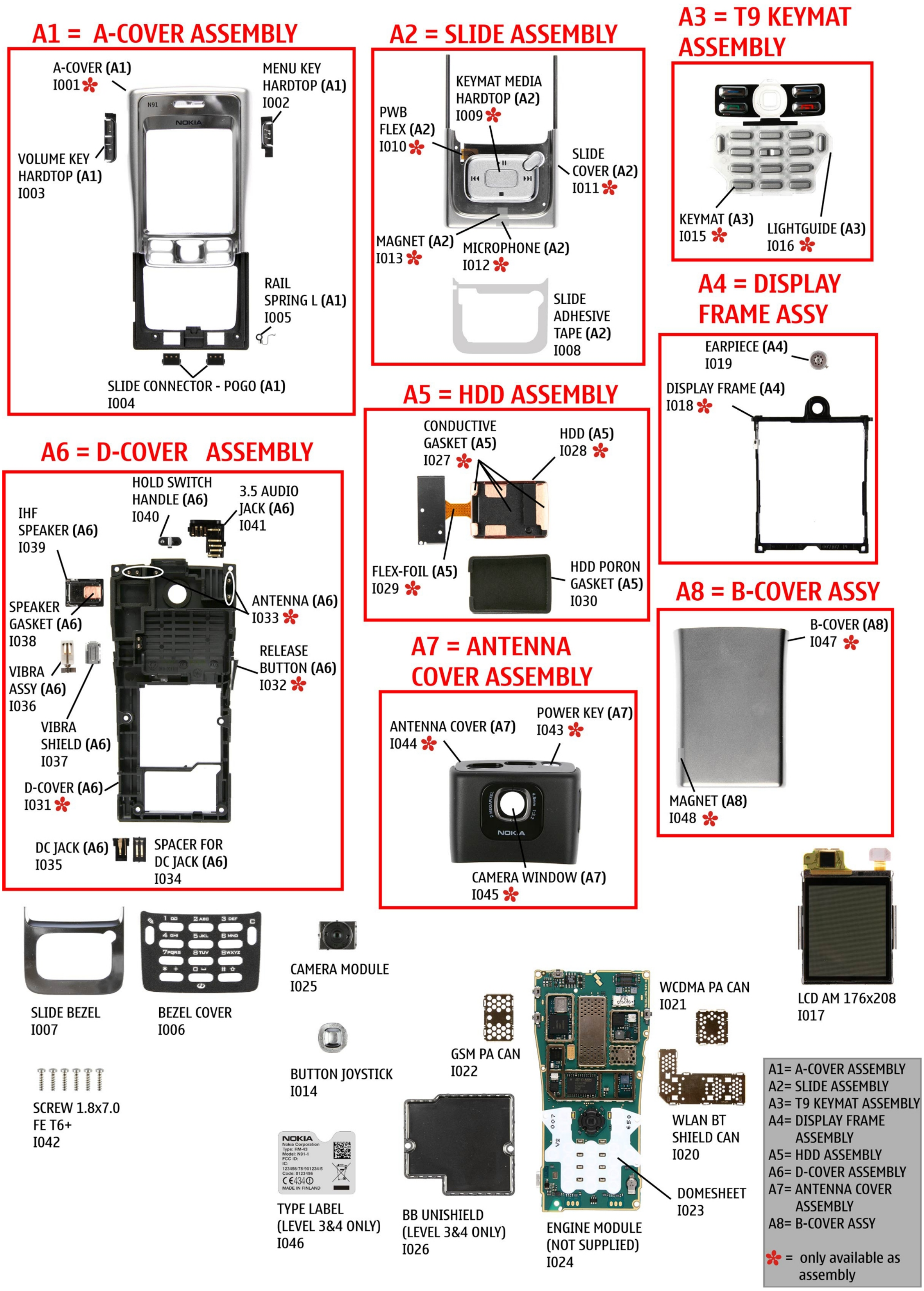
Exploded view

N91 RM-43 Exploded view


SLIDE ADHESIVE TAPE (A2) I008
SLIDE BEZEL I007
PWB FLEX (A2) I010 ✻
MICROPHONE (A2) I012 ✻
MAGNET (A2) I013 ✻
SLIDE COVER (A2) I011 ✻
MENU KEY HARDTOP (A1) I002
KEYMAT MEDIA HARDTOP (A2) I009 ✻
A-COVER (A1) ✻ I001
SLIDE CONNECTOR - POGO (A1) I004
RAIL SPRING L (A1) I005
BEZEL COVER I006
VOLUME KEY HARDTOP (A1) I003
BUTTON JOYSTICK I014
LCD AM 176x208 I017
KEYMAT (A3) I015 ✻
LIGHTGUIDE (A3) I016 ✻
DISPLAY FRAME (A4) ✻ I018
WLAN BT SHIELD CAN I020
EARPIECE (A4) I019
WCDMA PA CAN I021
DOMESHEET I023
ENGINE MODULE (NOT SUPPLIED) I024
CAMERA MODULE I025
GSM PA CAN I022
FLEX-FOIL (A5) I029 ✻
CONDUCTIVE GASKET (A5) ✻ I027
HDD (A5) ✻ I028
BB UNISHIELD (LEVEL 3&4 ONLY) I026
TYPE LABEL (LEVEL 3&4 ONLY) I046
HDD PORON GASKET (A5) I030
SPACER FOR DC JACK (A6) I034
3.5 AUDIO JACK (A6) I041
DC JACK (A6) I035
RELEASE BUTTON (A6) ✻ I032
VIBRA ASSY (A6) I036
D-COVER (A6) I031 ✻
ANTENNA (A6) ✻ I033
VIBRA SHIELD (A6) I037
HOLD SWITCH HANDLE (A6) I040
IHF SPEAKER (A6) I039
SPEAKER GASKET (A6) I038
SCREW 1.8x7.0 FE T6+ I042
MAGNET (A8) I048 ✻
ANTENNA COVER (A7) ✻ I044
POWER KEY (A7) ✻ I043
B-COVER (A8) I047 ✻
CAMERA WINDOW (A7) ✻ I045
A1= A-COVER ASSEMBLY
A2= SLIDE ASSEMBLY
A3= T9 KEYMAT ASSEMBLY
A4= DISPLAY FRAME ASSEMBLY
A5= HDD ASSEMBLY
A6= D-COVER ASSEMBLY
A7= ANTENNA COVER ASSEMBLY
A8= B-COVER ASSY
✻ = only available as assembly
● ELECTRO
● SILICON
● METAL
● PLASTIC
● PWB
● COVER

Spare parts overview

Spare Parts overview N91 RM-43


A1 = A-COVER ASSEMBLY
A-COVER (A1)
I001 ✻
MENU KEY
HARDTOP (A1)
I002
VOLUME KEY
HARDTOP (A1)
I003
RAIL
SPRING L (A1)
I005
SLIDE CONNECTOR - POGO (A1)
I004
A2 = SLIDE ASSEMBLY
KEYMAT MEDIA
HARDTOP (A2)
I009 ✻
PWB
FLEX (A2)
I010 ✻
SLIDE
COVER (A2)
I011 ✻
MAGNET (A2)
I013 ✻
MICROPHONE (A2)
I012 ✻
SLIDE
ADHESIVE
TAPE (A2)
I008
A3 = T9 KEYMAT
ASSEMBLY
KEYMAT (A3)
I015 ✻
LIGHTGUIDE (A3)
I016 ✻
A4 = DISPLAY
FRAME ASSY
EARPIECE (A4)
I019
DISPLAY FRAME (A4)
I018 ✻
A5 = HDD ASSEMBLY
CONDUCTIVE
GASKET (A5)
I027 ✻
HDD (A5)
I028 ✻
FLEX-FOIL (A5)
I029 ✻
HDD PORON
GASKET (A5)
I030
A6 = D-COVER ASSEMBLY
HOLD SWITCH
HANDLE (A6)
I040
3.5 AUDIO
JACK (A6)
I041
IHF
SPEAKER (A6)
I039
SPEAKER
GASKET (A6)
I038
ANTENNA (A6)
I033 ✻
RELEASE
BUTTON (A6)
I032 ✻
VIBRA
ASSY (A6)
I036
VIBRA
SHIELD (A6)
I037
D-COVER (A6)
I031 ✻
DC JACK (A6)
I035
SPACER FOR
DC JACK (A6)
I034
A7 = ANTENNA
COVER ASSEMBLY
ANTENNA COVER (A7)
I044 ✻
POWER KEY (A7)
I043 ✻
CAMERA WINDOW (A7)
I045 ✻
A8 = B-COVER ASSY
B-COVER (A8)
I047 ✻
MAGNET (A8)
I048 ✻
SLIDE BEZEL
I007
BEZEL COVER
I006
CAMERA MODULE
I025
BUTTON JOYSTICK
I014
SCREW 1.8x7.0
FE T6+
I042
GSM PA CAN
I022
TYPE LABEL
(LEVEL 3&4 ONLY)
I046
BB UNISHIELD
(LEVEL 3&4 ONLY)
I026
ENGINE MODULE
(NOT SUPPLIED)
I024
WCDMA PA CAN
I021
WLAN BT
SHIELD CAN
I020
DOMESHEET
I023
LCD AM 176x208
I017
A1= A-COVER ASSEMBLY
A2= SLIDE ASSEMBLY
A3= T9 KEYMAT ASSEMBLY
A4= DISPLAY FRAME ASSEMBLY
A5= HDD ASSEMBLY
A6= D-COVER ASSEMBLY
A7= ANTENNA COVER ASSEMBLY
A8= B-COVER ASSY
✻ = only available as assembly

Parts lists

Mechanical spare parts list

EXPLANATION

- Ax and in bold = ASSY
- I0xx = ITEM codes for upper or mono block
- I2xx = ITEM codes for lower block
- I3xx = ITEM codes for soldered spare parts on the upper hinge or lower block and not exchangeable

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

ITEM/CIRCUIT REF.	QTY	PART NAME
A1	**1**	**A-COVER ASSEMBLY(I001 - I005)**
I001	1	A-COVER
I002	1	MENU KEY HARDTOP
I003	1	VOLUME KEY HARDTOP
I004	2	SLIDE CONNECTOR - POGO
I005	1	RAIL SPRING L
I006	1	BEZEL COVER
I007	1	SLIDE BEZEL
A2	**1**	**SLIDE ASSEMBLY(I008 - I013)**
I008	1	SLIDE ADHESIVE TAPE
I009		KEYMAT MEDIA HARDTOP
I010	1	PWB FLEX
I011	1	SLIDE COVER
I012	1	MICROPHONE
I013	1	MAGNET
I014	1	BUTTON JOYSTICK
A3	**1**	**T9 KEYMAT ASSEMBLY(I015 - I016)**
I015	1	KEYMAT
I016	1	LIGHTGUIDE
I017	1	LCD AM 176X208
A4	1	DISPLAY FRAME ASSEMBLY(I018 - I019)
I018	1	DISPLAY FRAME
I019	1	EARPIECE105

I020	1	WLAN BT SHIELD CAN
I021	1	WCDMA PA CAN
I022	1	GSM PA CAN
I023	1	DOMESHEET
I024	1	ENGINE MODULE
I025	1	CAMERA MODULE
I026	1	BB UNISHIELD
A5	**1**	**HDD ASSEMBLY(I027 - I030)**
I027	1	CONDUCTIVE GASKET
I028	1	HDD
I029	1	FLEX-FOIL
I030	1	HDD PORON GASKET
A6	**1**	**D-COVER ASSEMBLY(I031 - I041)**
I031	1	D-COVER
I032	1	RELEASE BUTTON
I033	1	ANTENNA
I034	1	SPACER FOR DC JACK
I035	1	DC JACK
I036	1	VIBRA ASSY
I037	1	VIBRA SHIELD
I038	1	SPEAKER GASKET
I039	1	IHF SPEAKER
I040	1	HOLD SWITCH HANDLE
I041	1	3,5 AUDIO JACK
I042	6	SCREW 1.8X7.0 FE T6+
A7	**1**	**ANTENNA COVER ASSEMBLY (I043-I045)**
I043	1	POWER KEY
I044	1	ANTENNA COVER
I045	1	CAMERA WINDOW
I046	1	TYPE LABEL
A8	**1**	**B-COVER ASSY (I047-I048)**
I047	1	B-COVER
I048	1	MAGNET

Component parts list (1jy_21a)

Item	Side	X	Y	Type	Description and Value		
A6300	Top	F	12	SHIELD_BT_WLAN_FM	CAN BT_WLAN_FM NEMOW	~	~
A7000	Top	F	17	SHIELD_040_017522	RF SHIELD ONE PIECE	~	~
A7001	Top	I	17	SHIELD_DMC07007	WDCMA PA CAN DMC07007 RM-1	~	~
A7002	Top	C	18	SHIELD_DMC07005	GSM PA CAN DMC07005 RM-1	~	~
A7003	Top	I	15	SHIELD_DMD11427	VCO CAN DMD11427 RM-1	~	~
B2100	Bottom	B	20	NEMOW_IHF_SPACER	NEMOW CUSTOM IHF SPACER	~	~
B2200	Bottom	E	11	CRYSTAL_3.3X1.6_H0.9	CRYSTAL 32.768KHZ +-30PPM 12.5PF	32.768kHz	~
C1472	Top	E	22	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1473	Top	E	21	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C1474	Top	E	21	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C1475	Top	E	21	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C1476	Top	E	21	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C1477	Top	E	21	0402C	Chipcap X7R 10% 16V 0402	10n	16V

Item	Side	X	Y	Type	Description and Value		
C2000	Top	C	3	0402C	Chipcap 5% NP0	27p	50V
C2002	Bottom	I	19	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2003	Bottom	H	19	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2004	Bottom	H	19	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2011	Bottom	H	20	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2012	Top	C	3	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n	25V
C2015	Bottom	J	19	0402C	Chipcap 5% NP0	22p	50V
C2016	Bottom	J	19	0402C	Chipcap 5% NP0	22p	50V
C2017	Bottom	F	9	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C2018	Bottom	F	9	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2019	Bottom	F	8	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2020	Bottom	F	8	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2023	Bottom	F	10	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C2024	Bottom	F	10	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C2025	Bottom	F	9	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V

Item	Side	X	Y	Type	Description and Value		
C2026	Bottom	F	9	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5	4V
C2027	Top	C	3	0402C	Chipcap X7R 10% 25V 0402	6n8	25V
C2028	Bottom	J	19	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2029	Bottom	J	19	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2030	Bottom	E	9	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2031	Bottom	E	9	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2032	Bottom	E	10	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2033	Bottom	F	10	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2034	Bottom	E	10	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C2035	Bottom	F	10	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C2036	Bottom	H	19	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2037	Bottom	H	19	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2038	Top	J	21	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2070	Bottom	I	12	0402C	Chipcap 5% NP0	27p	50V
C2100	Top	C	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V

Item	Side	X	Y	Type	Description and Value		
C2101	Top	C	2	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2108	Bottom	G	10	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2109	Bottom	G	10	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2110	Bottom	G	10	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2115	Bottom	E	10	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2117	Bottom	E	8	0402C	Chipcap 5% NP0	47p	50V
C2120	Bottom	E	9	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C2121	Bottom	E	9	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C2123	Bottom	E	9	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C2124	Bottom	E	8	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C2125	Top	C	3	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C2126	Top	B	21	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2127	Top	B	21	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2128	Top	B	21	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2129	Bottom	D	8	0603C_H0.95	CHIPCAP X5R 1U0 K 10V 0603	1u0	10V

Item	Side	X	Y	Type	Description and Value		
C2130	Bottom	D	8	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2131	Bottom	D	8	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C2132	Bottom	E	8	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C2133	Top	H	21	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C2134	Top	H	21	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C2200	Bottom	F	10	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C2201	Bottom	E	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2202	Bottom	E	12	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2203	Bottom	E	10	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2205	Bottom	E	10	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2207	Bottom	F	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2208	Bottom	E	11	0402C	Chipcap 5% NP0	27p	50V
C2209	Bottom	E	11	0402C	Chipcap 5% NP0	22p	50V
C2210	Bottom	G	12	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C2211	Bottom	H	11	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7	10V

Item	Side	X	Y	Type	Description and Value		
C2212	Bottom	G	11	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C2213	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2214	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2215	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2216	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2217	Bottom	E	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2219	Bottom	E	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2220	Bottom	G	11	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C2221	Bottom	G	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2222	Bottom	G	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2223	Bottom	F	10	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2224	Bottom	F	10	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2225	Bottom	E	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2226	Bottom	G	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V

Item	Side	X	Y	Type	Description and Value		
C2227	Bottom	G	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2228	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2230	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2231	Bottom	G	11	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C2232	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2235	Bottom	E	10	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C2237	Bottom	F	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2238	Bottom	F	10	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C2239	Bottom	F	10	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C2240	Top	H	11	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2241	Top	H	12	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2300	Bottom	I	9	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2301	Bottom	I	9	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2302	Bottom	H	9	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3

Item	Side	X	Y	Type	Description and Value		
C2303	Bottom	J	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2304	Bottom	H	9	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C2306	Bottom	J	10	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2307	Bottom	J	10	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2309	Bottom	J	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C2312	Bottom	J	10	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2313	Bottom	J	11	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2314	Bottom	H	11	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7	25V
C2315	Bottom	J	11	0805C_RKNM	CHIPCAP X5R 4U7 K 25V 0805	4u7	25V
C2316	Bottom	I	11	0402C	Chipcap X7R 10% 25V 0402	6n8	25V
C2700	Bottom	D	4	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2800	Bottom	C	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2801	Bottom	C	12	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2802	Bottom	C	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	X	Y	Type	Description and Value		
C2803	Bottom	E	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2804	Bottom	C	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2805	Bottom	D	12	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2806	Bottom	B	12	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2807	Bottom	C	12	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C2808	Bottom	D	12	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2809	Bottom	C	12	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2810	Bottom	E	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2811	Bottom	D	12	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2812	Bottom	D	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2813	Bottom	C	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C2814	Bottom	C	10	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3000	Bottom	C	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3001	Bottom	C	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	X	Y	Type	Description and Value		
C3002	Bottom	D	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3003	Bottom	C	6	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3004	Bottom	C	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3005	Bottom	C	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3006	Bottom	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C3007	Bottom	C	8	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C3008	Bottom	D	9	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4200	Bottom	E	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4201	Bottom	D	7	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C4202	Bottom	D	7	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C4400	Top	I	20	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4401	Top	I	20	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4402	Top	F	2	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C4404	Top	D	2	0402C	Chipcap X7R 5% 16V 0402	10n	16V

Item	Side	X	Y	Type	Description and Value		
C4405	Top	D	2	0402C	Chipcap X7R 5% 16V 0402	10n	16V
C4406	Top	D	2	0402C	Chipcap 5% NP0	27p	50V
C4407	Top	D	2	0402C	Chipcap 5% NP0	27p	50V
C4408	Top	E	3	0402C	Chipcap 5% NP0	27p	50V
C4409	Top	H	2	0402C	Chipcap 5% NP0	27p	50V
C4410	Top	H	2	0402C	Chipcap 5% NP0	27p	50V
C4411	Top	I	2	0402C	Chipcap 5% NP0	27p	50V
C4800	Bottom	G	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4801	Bottom	F	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C4802	Bottom	G	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4803	Bottom	E	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4804	Bottom	G	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4805	Bottom	F	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4806	Bottom	E	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4807	Bottom	F	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4808	Bottom	G	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V

Item	Side	X	Y	Type	Description and Value		
C4809	Bottom	F	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4810	Bottom	G	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4811	Bottom	E	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C4812	Bottom	E	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5000	Bottom	I	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5001	Bottom	H	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5002	Bottom	H	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5003	Bottom	I	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5004	Bottom	I	8	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5005	Bottom	G	6	0402C_H0.6	CHIPCAP X5R 100N M 16V 0402	100n	16V
C5007	Bottom	H	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5008	Bottom	H	8	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C5206	Bottom	I	19	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5210	Bottom	J	4	0402C	Chipcap 5% NP0	10p	50V
C5211	Bottom	J	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V

Item	Side	X	Y	Type	Description and Value		
C5213	Bottom	I	19	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C5214	Bottom	B	17	TANTAL_TAJR	CHIPTCAP 10U M 6V3 2.0X1.3X1.2	10u_6.3V	6.3V
C5215	Bottom	A	17	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5216	Bottom	B	16	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5220	Bottom	H	10	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5221	Bottom	G	9	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C5222	Top	D	21	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C5223	Top	C	21	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C5225	Bottom	G	10	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C5226	Bottom	G	8	0805C	CHIPCAP X5R 10U M 6V3 0805	10U	6V3
C5227	Bottom	B	17	0402C	Chipcap +-0.25pF NP0	4p7	50V
C5228	Bottom	B	17	0402C	Chipcap +-0.25pF NP0	4p7	50V
C5229	Bottom	B	18	0402C	Chipcap +-0.25pF NP0	4p7	50V
C5230	Bottom	B	18	0402C	Chipcap +-0.25pF NP0	4p7	50V

Item	Side	X	Y	Type	Description and Value		
C5231	Bottom	C	18	0402C	Chipcap +-0.25pF NP0	4p7	50V
C5232	Bottom	B	18	0402C	Chipcap 5% NP0	27p	50V
C5233	Bottom	B	17	0402C	Chipcap 5% NP0	27p	50V
C5234	Bottom	B	16	0402C	Chipcap 5% NP0	27p	50V
C5235	Bottom	C	18	0402C	Chipcap 5% NP0	27p	50V
C5236	Top	C	21	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C5237	Bottom	I	19	0402C	Chipcap 5% NP0	27p	50V
C6030	Top	B	15	0402C	Chipcap 5% NP0	100p	50V
C6031	Top	C	14	0402C	Chipcap 5% NP0	15p	50V
C6033	Top	C	15	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6036	Top	C	14	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C6037	Top	D	14	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6038	Top	C	15	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6039	Top	B	14	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6040	Top	B	14	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6041	Top	C	15	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3

Item	Side	X	Y	Type	Description and Value		
C6042	Top	C	14	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0	6.3V
C6043	Top	C	14	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6157	Top	I	12	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6158	Top	I	12	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6159	Top	H	13	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6162	Top	I	12	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6163	Top	I	13	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6165	Top	I	13	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6170	Top	J	12	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C6175	Top	H	13	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6176	Top	J	13	0402C	Chipcap 5% NP0	100p	50V
C6178	Top	J	13	0402C	Chipcap 5% NP0	27p	50V
C6179	Top	J	12	0402C	Chipcap 5% NP0	47p	50V
C6180	Bottom	G	10	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3
C6181	Bottom	G	10	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47	6V3

Item	Side	X	Y	Type	Description and Value		
C6300	Top	G	12	0805C	CHIPCAP X5R 22U M 6V3 0805	22u	6V3
C6301	Top	G	13	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C6302	Top	F	11	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6303	Top	G	12	0603C	CHIPCAP X5R 1U K 16V 0603	1u0	16V
C6304	Top	G	12	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6305	Top	F	11	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6307	Top	F	11	0603C_H0.95	CHIPCAP X5R 1U0 K 10V 0603	1u0	10V
C6308	Top	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6309	Top	D	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6310	Top	D	11	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6311	Top	D	13	0402C	CHIPCAP X7R 33N K 10V 0402	33n	10V
C6312	Top	D	11	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6313	Top	D	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6314	Top	D	11	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V

Item	Side	X	Y	Type	Description and Value		
C6315	Top	E	13	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6317	Top	E	11	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6318	Top	F	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6319	Top	E	11	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6320	Top	F	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6321	Top	E	11	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6322	Top	G	12	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6323	Top	F	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6324	Top	F	11	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6325	Top	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6326	Top	F	11	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6327	Top	F	13	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C6329	Top	C	11	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6330	Top	C	11	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V

Item	Side	X	Y	Type	Description and Value		
C6335	Top	C	11	0402C	CHIPCAP NP0 220P J 25V 0402	220p	25V
C6338	Top	B	12	0402C	Chipcap 5% NP0	47p	50V
C6344	Top	D	12	0402C	Chipcap +-0.25pF NP0	3p9	50V
C6345	Top	C	12	0402C	Chipcap +-0.25pF NP0	3p9	50V
C6346	Top	F	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6347	Top	F	13	0402C	Chipcap 5% NP0	82p	50V
C6348	Top	E	13	0603C_H0.95	CHIPCAP X5R 1U0 K 10V 0603	1u0	10V
C6351	Top	E	13	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C6352	Top	D	13	0402C	Chipcap 5% NP0	150p	50V
C6360	Top	E	13	0402C	CHIPCAP NP0 220P J 25V 0402	220p	25V
C6380	Top	E	11	0402C	Chipcap 5% NP0	100p	50V
C6382	Top	G	11	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2	6V3
C6383	Top	C	12	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6384	Top	C	12	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6385	Top	B	12	0402C	Chipcap +-0.25pF NP0	6p8	50V
C6386	Top	B	12	0402C	Chipcap +-0.25pF NP0	6p8	50V

Item	Side	X	Y	Type	Description and Value		
C6387	Top	G	11	0402C	Chipcap 5% NP0	100p	50V
C7501	Top	G	18	0402C	Chipcap 5% NP0	18p	50V
C7503	Top	G	19	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7504	Top	G	18	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7505	Top	F	18	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C7507	Top	E	18	0402C	Chipcap 5% NP0	18p	50V
C7508	Top	E	18	0402C	Chipcap 5% NP0	18p	50V
C7509	Top	E	19	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7512	Top	D	20	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7513	Top	F	18	0402C	Chipcap X7R 10% 25V 0402	4n7	25V
C7514	Top	D	19	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7515	Top	G	16	0402C	Chipcap 5% NP0	10p	50V
C7516	Top	E	16	0402C	Chipcap 5% NP0	150p	50V
C7518	Top	G	19	0402C	CHIPCAP X5R 100N K 10V 0402	100n	10V
C7520	Top	G	19	0402C	Chipcap 5% NP0	18p	50V
C7522	Top	E	17	0402C	Chipcap 5% NP0	150p	50V
C7523	Top	D	19	0402C	Chipcap +-0.25pF NP0	1p5	50V

Item	Side	X	Y	Type	Description and Value		
C7524	Top	E	17	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7525	Top	D	18	0402C	Chipcap +-0.25pF NP0	1p5	50V
C7527	Top	E	18	0402C	Chipcap 5% NP0	100p	50V
C7528	Top	E	18	0402C	Chipcap 5% NP0	22p	50V
C7529	Top	G	17	0402C	Chipcap 5% NP0	100p	50V
C7530	Top	G	18	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7531	Top	E	18	0402C	Chipcap 5% NP0	22p	50V
C7532	Top	G	18	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7533	Top	G	16	0402C	Chipcap X7R 10% 16V 0402	10n	16V
C7534	Top	G	18	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7535	Top	F	18	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7536	Top	G	18	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7541	Top	G	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7543	Top	F	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7545	Top	B	17	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7547	Top	G	16	0402C	Chipcap +-0.25pF NP0	1p8	50V

Item	Side	X	Y	Type	Description and Value		
C7548	Top	G	16	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7549	Top	F	16	0402C	Chipcap 5% NP0	100p	50V
C7550	Top	G	14	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7552	Top	F	14	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7553	Top	F	14	0402C	Chipcap X7R 10% 16V 0402	8n2	16V
C7554	Top	J	15	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7555	Top	J	15	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
C7556	Top	D	17	0402C	Chipcap 5% NP0	10p	50V
C7558	Top	F	16	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7559	Top	C	18	0402C	Chipcap +-0.25pF NP0	1p0	50V
C7560	Top	F	14	0402C	Chipcap X7R 10% 25V 0402	4n7	25V
C7561	Top	D	17	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7563	Top	D	18	0402C	Chipcap +-0.25pF NP0	4p7	50V
C7564	Top	C	18	0402C	Chipcap X7R 10% 50V 0402	1n0	50V
C7567	Top	E	15	0402C	Chipcap 5% NP0	15p	50V
C7568	Top	G	14	0402C	Chipcap 5% NP0	150p	50V

Item	Side	X	Y	Type	Description and Value		
C7569	Top	D	18	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7570	Top	G	15	0402C	Chipcap 5% NP0	18p	50V
C7571	Top	J	14	0402C	CHIPCAP NP0 330P J 50V 0402	330p	50V
C7573	Top	G	14	0603C	CHIPCAP NP0 2N2 G 16V 0603	2n2	16V
C7575	Top	E	15	0402C	Chipcap 5% NP0	15p	50V
C7577	Top	E	15	0402C	Chipcap 5% NP0	15p	50V
C7579	Top	H	17	0402C	Chipcap 5% NP0	10p	50V
C7580	Top	I	17	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0	6.3V
C7581	Top	D	19	0402C	Chipcap +-0.25pF NP0	1p8	50V
C7582	Top	F	14	0402C	Chipcap 5% NP0	100p	50V
C7583	Top	I	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7584	Top	D	19	0402C	Chipcap +-0.25pF NP0	1p8	50V
C7585	Top	I	18	0402C	CHIPCAP NP0 1P0 B 50V 0402	1p0	50V
C7586	Top	I	17	0402C	Chipcap 5% NP0	10p	50V
C7587	Top	I	17	0402C	Chipcap 5% NP0	10p	50V
C7589	Top	H	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7590	Top	J	17	0402C	Chipcap 5% NP0	10p	50V

Item	Side	X	Y	Type	Description and Value		
C7591	Top	J	17	0402C	CHIPCAP NP0 470P J 6V3 0402	470p	6V3
C7592	Top	J	17	0402C	Chipcap 5% X7R	3n3	50V
C7593	Top	C	16	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7	6.3V
C7596	Top	F	19	0402C	Chipcap +-0.25pF NP0	2p7	50V
C7597	Top	D	15	TANT_6.3X3.5_H2.0	CHIPTCAP 100U M 14V 6X3.2X2	100u_14V	14V
C7598	Top	G	16	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5	50V
D2800	Bottom	C	11	uBGA_289	RAP3G V2.20E F761800 12C027 U*BGA	~	~
D3000	Bottom	C	7	PBFREEBGA40_64MB_66MHZ_MAX	FLASH 4MX16 1.8/1.8V FBGA44 PBFREE	4Mx16	~
D3001	Bottom	C	9	SDRAM_110MHZ_64MBIT_BGA60_PBFREE_MAX	SDRAM 4MX16 1.8V/1.8V WBGA60 PBFREE	4Mx16	~
D4800	Bottom	F	7	uBGA_289	HELEN2ES2.0PBGA289	~	~
D5000	Bottom	I	7	FBGA133	COMBO 512 DDR + 512M NAND FBGA133 PBFREE	32Mx16/64Mx8	~
F2000	Top	B	2	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A	~

Item	Side	X	Y	Type	Description and Value		
G2200	Top	J	3	BATTER_RB414H	RTC CAPACITOR 15UAH 2.6/3.3V 414-SIZE	3V3	~
G7500	Top	F	17	VCO_FDK_IT_H1.7	VCO 3610-4340 MHZ 2.7V 13MA WCDMA FDD	3610-4340 MHz	~
G7501	Top	G	17	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz	~
G7502	Top	I	15	VCO_FDK_IT_H1.7	VCO 3420-3960 MHZ 2.7V 14MA WCDMA FDD	3420-3960 MHz	~
L1472	Top	E	22	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L1473	Top	E	21	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L2000	Top	B	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2001	Bottom	J	19	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/100MHz	~
L2002	Bottom	J	19	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/100MHz	~

Item	Side	X	Y	Type	Description and Value		
L2003	Bottom	H	21	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/ 100MHz	~
L2004	Bottom	I	19	0603_BLM	FERRITE BEAD 1000R 300MA 0603	1000R/ 100MHz	~
L2005	Bottom	I	19	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/ 100MHz	~
L2006	Bottom	H	21	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/ 100MHz	~
L2007	Top	J	22	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/ 100MHz	~
L2008	Bottom	H	19	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/ 100MHz	~
L2009	Bottom	H	19	0603_BLM	FERRITE BEAD 1500R 250MA 0603	1500R/ 100MHz	~
L2010	Bottom	H	20	0402L	CHIP COIL 47N J Q23/800M 0402	47nH	~
L2011	Bottom	J	20	0402L	CHIP COIL 47N J Q23/800M 0402	47nH	~

Item	Side	X	Y	Type	Description and Value		
L2100	Bottom	G	22	0405_2_MATSU	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/ 100MHz	~
L2105	Bottom	C	14	0603L	CHIP COIL 39NH Q15 0.8R 0.6A 0603	39nH	~
L2106	Bottom	C	14	0603L	CHIP COIL 39NH Q15 0.8R 0.6A 0603	39nH	~
L2107	Bottom	E	8	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~
L2108	Top	B	21	0405_2_MATSU	EXC24CP221U 2X220R 0405	2x220R/ 100MHz	~
L2109	Top	B	21	0603L	CHIP COIL 39NH Q15 0.8R 0.6A 0603	39nH	~
L2110	Top	B	21	0603L	CHIP COIL 39NH Q15 0.8R 0.6A 0603	39nH	~
L2111	Bottom	G	10	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2112	Bottom	G	10	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/ 100MHz	~
L2202	Bottom	E	12	0603_BLM	FERR.BEAD 220R/ 100M 2A 0R05 0603	220R/ 100MHz	~
L2203	Bottom	F	13	FERRITE_0402	FERRITE BEAD 0.6R 600R/ 100MHZ 0402	600R/ 100MHz	~

Item	Side	X	Y	Type	Description and Value		
L2204	Bottom	E	12	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L2205	Bottom	G	11	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2206	Bottom	F	13	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L2301	Bottom	I	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L2302	Bottom	H	9	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L2304	Bottom	I	11	CHOKE_SER300_H1.5	CHOKE 22UM 0R7 0.35A 3.0x3.0x1.5	22uH	~
L4200	Bottom	D	6	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L4201	Bottom	D	7	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz	~
L4400	Top	I	20	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L4401	Top	I	20	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~

Item	Side	X	Y	Type	Description and Value		
L4402	Top	D	2	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L4403	Top	E	2	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L4404	Top	E	2	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L4405	Top	H	2	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L4406	Top	H	2	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L4407	Top	I	2	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L5200	Top	C	21	FERRITE_FB MJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz	~
L5201	Bottom	B	16	0402L_XL	FERRITE BEAD 220R 0R45 0.3A 0402	220R/100MHz	~
L6030	Top	C	14	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L6032	Top	C	14	0402L	CHIP COIL 1N8+-0N3 Q31/800M 0402	1n8H	~
L6156	Top	I	12	COIL_0603CS	CHIP COIL 47N G Q38/200MHZ 0603	47nH	~

Item	Side	X	Y	Type	Description and Value		
L6175	Top	H	12	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L6176	Top	J	13	COIL_LQW1608	CHIP COIL 120N J Q32/150MHZ 0603	120nH	~
L6300	Top	C	12	0402L	CHIP COIL 8N2 J Q28/800MHZ 0402	8n2H	~
L7502	Top	F	14	0402L	CHIP COIL 100N J Q16/300M 0402	100nH	~
L7503	Top	G	16	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L7504	Top	D	20	0402L	CHIP COIL 22N J Q28/800M 0402	22nH	~
L7505	Top	D	19	0402L	CHIP COIL 12N J Q31/800M 0402	12nH	~
L7506	Top	D	19	0402L	CHIP COIL 10N J Q30/800M 0402	10nH	~
L7510	Top	F	15	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~
L7511	Top	E	15	0402L	CHIP COIL 10N J Q30/800M 0402	10nH	~
L7512	Top	F	15	0402L	CHIP COIL 4N7 +-0N3 Q28/800M 0402	4n7H	~

Item	Side	X	Y	Type	Description and Value		
L7514	Top	I	18	0402L	CHIP COIL 6N8 J Q27/800M 0402	6n8H	~
L7515	Top	I	16	CHOKE_SER400	CHOKE 10U 0.8A 0R24 4X4X1.8	10uH	~
L7516	Top	C	16	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
L7517	Top	G	15	0402L	CHIP COIL 1N5 +-0N3 Q33/800M 0402	1n5H	~
N1470	Top	E	21	USMD5_1.468X1.036	REG+ LP3999ITLX 1.8V 150MA NOPB	~	1.8V
N1471	Top	E	21	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-2.8 NOPB USMD5	~	3V
N2000	Bottom	F	9	XBGA_N16_2.19X2.19	AFAMP TPA4411 2X 80MW 1.8/4.5V WCSP16	~	~
N2100	Bottom	E	9	PBGA_N80	STE CODEC W/AF AMP TLV320AIC33	~	~
N2101	Bottom	D	8	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-3.0 NOPB USMD5	~	3V
N2200	Bottom	F	11	TFBGA_108	RETU 3.02 TSA1GJWE TFBGA108	~	~
N2300	Bottom	I	10	TFBGA_84_6.15X6.15	TAHVO V5.2 LF TFBGA84	~	~

Item	Side	X	Y	Type	Description and Value		
N2301	Bottom	H	11	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~	~
N4200	Bottom	D	7	USMD_10_2.458X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~	~
N4400	Top	F	2	TSOP_6L_H1.1	HALL IC SWITCH TLE4917 TSSOP6	~	~
N5000	Bottom	H	9	USMD4_1.313X1.033	REG LP3990TLX-1.8 NOPB 4BUMPS USMD4	~	1.8V
N5200	Bottom	G	9	PBGA_N48	LEVEL SHIFT SN74AVCA406ZQCR 1.8/3V BGA48	~	~
N5203	Bottom	J	4	TSOP_6L_H1.1	HALL IC SWITCH TLE4917 TSSOP6	~	~
N5204	Bottom	B	18	QFN28_7.1X7.1_EXPOSED	ACCELEROMETER 3-AXIS 2.4V QFN28	~	~
N5205	Top	D	21	SO8N2	TPS72501 1A ADJ SO-8	~	1V
N6030	Top	C	15	uBGA63_4.6X4.6	BRF6150	~	~
N6158	Top	I	13	WFBGA34_2_3.57X3.57	FM RECEIVER TEA5761UK N4B CSP (TI)	~	~
N6300	Top	E	12	LFBGA_228	WLAN MCM STLC4370 F3 LINEAR EM LFBGA228	~	~

Item	Side	X	Y	Type	Description and Value		
N6301	Top	C	12	RF5924_FIDUS	WLAN RF5924 ES3.5	~	~
N6302	Top	C	11	SOT_666	TRX2+RX4 PEMD9 N10K/47K 0W12 SOT666	~	~
N7500	Top	F	18	TFBGA_84_6.15X6.15	RF ASIC HINKU310A TFBGA84	~	~
N7501	Top	F	15	TFBGA64_H1.2	RF ASIC VINKU314A TFBGA64	~	~
N7502	Top	C	17	RITSA_PA_REL3	PW AMP RF9292E9.2 QUADBAND	~	~
N7503	Top	H	18	RF9252E2.1	PW AMP RF9252E8.2 1920-1980 MHZ	~	~
N7504	Top	I	16	USMD10_2.534X2.026	DC CONV SUPA LM2706 PBFREE	~	~
R1470	Bottom	E	7	0402R	Resistor 5% 63mW	100R	~
R1471	Bottom	E	7	0402R	Resistor 5% 63mW	100R	~
R1472	Top	G	20	0402R	Resistor 5% 63mW	3k3	~
R1473	Top	G	20	0402R	Resistor 5% 63mW	3k3	~
R1474	Bottom	E	7	0402R	Resistor 5% 63mW	33R	~
R2000	Bottom	I	19	0402R	Resistor 5% 63mW	220R	~
R2007	Bottom	C	4	uBGA11_1.6X2.15	ASIP SILIC USB OTG / ESD BGA11	~	~
R2009	Bottom	H	20	0402R	Resistor 5% 63mW	100R	~

Item	Side	X	Y	Type	Description and Value		
R2017	Bottom	H	19	uBGA11_2.15X1.65	ASIP MIC W/ESD RES +CAP+ZDI BGA11	~	~
R2018	Bottom	C	3	0402R	Resistor 5% 63mW	220k	~
R2019	Bottom	H	20	0402R	Resistor 5% 63mW	120k	~
R2021	Bottom	J	19	0405_2	VARISTOR ARRAY 2XVWM16V VC50 0405	2XVWM16V	~
R2022	Bottom	H	20	0405_2	VARISTOR ARRAY 2XVWM16V VC50 0405	2XVWM16V	~
R2023	Top	J	21	0402R	Resistor 5% 63mW	100k	~
R2024	Bottom	F	9	0402R	Resistor 5% 63mW	100k	~
R2025	Bottom	F	10	0402R	Resistor 5% 63mW	22R	~
R2026	Bottom	F	10	0402R	Resistor 5% 63mW	22R	~
R2030	Bottom	F	9	0402R	Chipres 0W06 jumper 0402	0R	~
R2031	Bottom	F	9	0402R	Chipres 0W06 jumper 0402	0R	~
R2032	Bottom	F	10	0402R	Resistor 5% 63mW	22R	~
R2033	Bottom	E	10	0402R	Resistor 5% 63mW	22R	~
R2060	Bottom	J	3	uBGA5	ASIP 4XESD **PB-FREE** BGA5	~	~

Item	Side	X	Y	Type	Description and Value		
R2061	Bottom	J	4	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2062	Bottom	J	4	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2070	Bottom	H	12	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2071	Bottom	H	12	0402_NTH5	NTC RES 47K J B=4050 +-3% 0402	47k	~
R2072	Bottom	I	12	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2104	Bottom	G	21	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2105	Bottom	G	21	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2106	Top	B	21	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2107	Top	B	21	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~

Item	Side	X	Y	Type	Description and Value		
R2108	Top	C	3	uBGA11_2.15X1.65	ASIP MIC W/ESD RES +CAP+ZDI BGA11	~	~
R2111	Top	C	3	0402R	Resistor 5% 63mW	220R	~
R2200	Bottom	E	12	0402R	Resistor 5% 63mW	100k	~
R2201	Bottom	E	13	0402R	Resistor 5% 63mW	120k	~
R2205	Bottom	E	11	0402R	CHIPRES 0W06 2M2 J 0402	2M2	~
R2206	Top	J	4	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R2304	Bottom	H	10	0402R	Resistor 5% 63mW	33R	~
R2308	Bottom	H	10	0603_VAR	CHIP VARISTOR VWM19V VC27V 0603	19V/27V	~
R2700	Bottom	C	4	uBGA8_1.47X1.47	ASIP SIM INTERFACE **LOW CAP**BGA8	~	~
R2800	Top	B	11	0402R	CHIPRES 0W06 10K F 0402	10k	~
R3000	Bottom	C	8	0402R	Resistor 5% 63mW	4k7	~
R4405	Top	A	17	uBGA5	ASIP 4XESD **PB-FREE** BGA5	~	~
R4406	Top	K	18	uBGA5	ASIP 4XESD **PB-FREE** BGA5	~	~
R4407	Top	B	22	0402R	Resistor 5% 63mW	4k7	~

Item	Side	X	Y	Type	Description and Value		
R4408	Top	B	22	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4413	Bottom	G	21	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V	~
R4414	Top	J	21	0402R	Resistor 5% 63mW	68R	~
R4415	Bottom	G	9	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R4416	Bottom	G	8	0402R	Resistor 5% 63mW	5k6	~
R4417	Bottom	H	10	0402R	CHIPRES 0W06 1K3 F 250PPM 0402	1k3	~
R4418	Bottom	H	10	0402R	CHIPRES 0W06 1K3 F 250PPM 0402	1k3	~
R4419	Bottom	H	10	0402R	CHIPRES 0W06 1K5 F 100PPM 0402	1k5	~
R4420	Bottom	H	10	0402R	CHIPRES 0W06 1K5 F 100PPM 0402	1k5	~
R4421	Bottom	G	21	0402R	Resistor 5% 63mW	100R	~
R4800	Bottom	G	8	0402R	Resistor 5% 63mW	10R	~
R5099	Top	H	8	0402R	Chipres 0W06 jumper 0402	0R	~
R5100	Bottom	C	3	0402R	Resistor 5% 63mW	10k	~
R5218	Bottom	I	12	0402R	Resistor 5% 63mW	5k6	~

Item	Side	X	Y	Type	Description and Value		
R5221	Bottom	J	4	0402R	Resistor 5% 63mW	100k	~
R5222	Bottom	A	18	0402R	Resistor 5% 63mW	100k	~
R5224	Bottom	F	8	0402R	Resistor 5% 63mW	22R	~
R5231	Top	C	21	0402R	CHIPRES 0W06 120K F 200PPM 0402	120k	~
R5232	Top	C	21	0402R	Chipres 0W06 180k F 200ppm 0402	180k	~
R5238	Top	E	22	0402R	Resistor 5% 63mW	100k	~
R5241	Bottom	E	8	0402R	Resistor 5% 63mW	22R	~
R5242	Bottom	A	18	0402R	Resistor 5% 63mW	3k3	~
R5243	Bottom	A	17	0402R	Resistor 5% 63mW	3k3	~
R6107	Top	H	12	0402R	Resistor 5% 63mW	3k3	~
R6108	Top	H	12	0402R	Resistor 5% 63mW	3k3	~
R6159	Top	I	12	0402R	Resistor 5% 63mW	10k	~
R6160	Top	I	12	0402R	Resistor 5% 63mW	100k	~
R6300	Top	E	11	0402R	CHIPRES 0W06 1M F 100PPM 0402	1M0	~
R6301	Top	F	13	0402R	Resistor 5% 63mW	1k2	~
R6354	Top	D	13	0402R	Resistor 5% 63mW	3k3	~
R7501	Top	E	16	0402R	Resistor 5% 63mW	1k0	~
R7503	Top	G	15	0402R	Resistor 5% 63mW	4k7	~

Item	Side	X	Y	Type	Description and Value		
R7504	Top	G	19	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7505	Top	E	17	0402R	CHIPRES 0W06 8K2 F 0402	8k2	~
R7506	Top	D	18	0402R	Resistor 5% 63mW	270R	~
R7509	Top	G	16	0402R	Resistor 5% 63mW	22k	~
R7514	Top	F	16	0402R	Resistor 5% 63mW	12k	~
R7516	Top	C	18	0402R	Resistor 5% 63mW	1k0	~
R7518	Top	B	18	0402R	Resistor 5% 63mW	470k	~
R7519	Top	G	14	0402R	Resistor 5% 63mW	1k0	~
R7520	Top	E	15	0402R	Resistor 5% 63mW	270R	~
R7521	Top	F	16	0402R	CHIPRES 0W06 10K F 0402	10k	~
R7522	Top	H	18	0402R	Resistor 5% 63mW	220k	~
R7523	Top	G	14	0402R	CHIPRES 0W06 9K1 F 100PPM 0402	9k1	~
R7525	Top	J	16	0402R	Resistor 5% 63mW	10R	~
R7526	Top	I	17	0402R	Resistor 5% 63mW	5k6	~
R7527	Top	I	17	0402R	Resistor 5% 63mW	220R	~
R7528	Top	G	15	0402R	Resistor 5% 63mW	470k	~
R7529	Top	J	17	0402R	Resistor 5% 63mW	2k2	~
R7530	Top	J	17	0402R	Resistor 5% 63mW	8k2	~

Item	Side	X	Y	Type	Description and Value		
R7531	Top	J	17	0402R	Resistor 5% 63mW	8k2	~
R7533	Top	F	17	0402R	Chipres 0W06 jumper 0402	0R	~
R7534	Top	B	18	0402R	Resistor 5% 63mW	470k	~
R7535	Top	D	17	0404_RAC10	RES NETWORK 0W04 2DB ATT 0404	436R/11R6/436R	~
S4401	Top	C	22	SWITCH_SKRE_II	SM TACT SW TRAV 0.2 4.1X3.55X1.75	~	~
S4403	Top	K	18	SWITCH_SKRE_II	SM TACT SW TRAV 0.2 4.1X3.55X1.75	~	~
S4404	Bottom	F	22	SWITCH_SSAD120101	SLIDE SWITCH 1-POLE 2-POS 5V DC	~	~
S4417	Top	F	9	SWITCH_EVQ_Q5A_05K	SM 5WAY DOME JOYSTICK 15V 20MA	~	~
S4418	Top	A	20	SWITCH_SKRE_II	SM TACT SW TRAV 0.2 4.1X3.55X1.75	~	~
S4419	Top	A	18	SWITCH_SKRE_II	SM TACT SW TRAV 0.2 4.1X3.55X1.75	~	~
T6030	Top	C	14	TRANS_LDB213	TRANSF BALUN 2400 +-100MHZ	~	~
T7500	Top	F	19	TRANS_LDB15	TRANSF BALUN 2134 +-90MHZ 0805	~	~

Item	Side	X	Y	Type	Description and Value		
T7501	Top	E	17	TRANS_LDB 15	TRANSF BALUN 3800 +-550MHZ 0805	~	~
T7502	Top	D	16	TRANS_LDB 15	TRANSF BALUN 1800 +-100mhz 2x1.25	~	~
T7503	Top	H	15	TRANS_LDB 15	TRANSF BALUN 3800 +-550MHZ 0805	~	~
V1470	Top	C	21	CASE_463	BAS16TT1 DIODE SURFACE MOUNTED SOT416	~	~
V2000	Top	B	3	CASE_457	TVS DI 1PMT16AT 3 16V 175W PWRMITE	~	~
V2301	Bottom	H	10	VMT3_R	TR DTC143ZM N RB=4K7 RBE=47K VMT3	~	~
V4401	Top	H	9	LED_LWL28 S	LED LWL283 WHITE 10MA 0603	~	~
V4402	Top	E	9	LED_LWL28 S	LED LWL283 WHITE 10MA 0603	~	~
V4405	Top	G	7	0603_LED_ H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~

Item	Side	X	Y	Type	Description and Value		
V4406	Top	E	7	0603_LED_H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~
V4407	Top	E	5	0603_LED_H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~
V4408	Top	G	5	0603_LED_H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~
V4409	Top	G	6	0603_LED_H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~
V4410	Top	E	6	0603_LED_H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~
V4411	Top	E	4	0603_LED_H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~
V4412	Top	G	4	0603_LED_H0.65	LED LBL293 BLUE INGAN 470NM 0603	~	~
V7500	Top	J	17	SOT_563	SCHDIX2 RF DETECTOR CT 1PF 0V39 SOT666	~	~
X1470	Bottom	F	20	SOCKET_DMD10413	CAMERA MOD.SOCKET 2X7POL SPR P1.4	~	~
X2001	Bottom	B	4	CON_UX60A_MB_5ST	CONNECTOR USB	~	~

Item	Side	X	Y	Type	Description and Value		
X2060	Top	C	4	TRACEABILITY_PAD	MODULE ID COMPONENT 2.8X1.8X0.3	~	~
X2070	Bottom	I	13	LYNX_BATT_CONN_H7.0	SM BATTERY CONN 3POL SPR 12V 2A	~	~
X2700	Bottom	G	3	SIM_CONN_P04_100157_001	SM SIM CONN 2X3POL P2.54 50V 0.5A	~	~
X4401	Top	I	21	JST_R_JAVK_G_1_R3	SM CONN 2X12F P0.4 30V 0.3A PCB/PCB	~	~
X5200	Bottom	F	16	MOLEX_MMC_94354_5013	CONN SMC HS-MMC	~	~
X5201	Bottom	F	18	SPRING_415CSS_098_51F	2 CONTACT SMD GROUND SPRING	~	~
Z2001	Bottom	C	3	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz	~
Z4402	Top	H	20	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4403	Top	J	20	uBGA25_2.47X2.47	ASIP 10-CH ESD EMI FILTER BGA25	~	~
Z4404	Top	E	8	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z4405	Top	G	10	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~

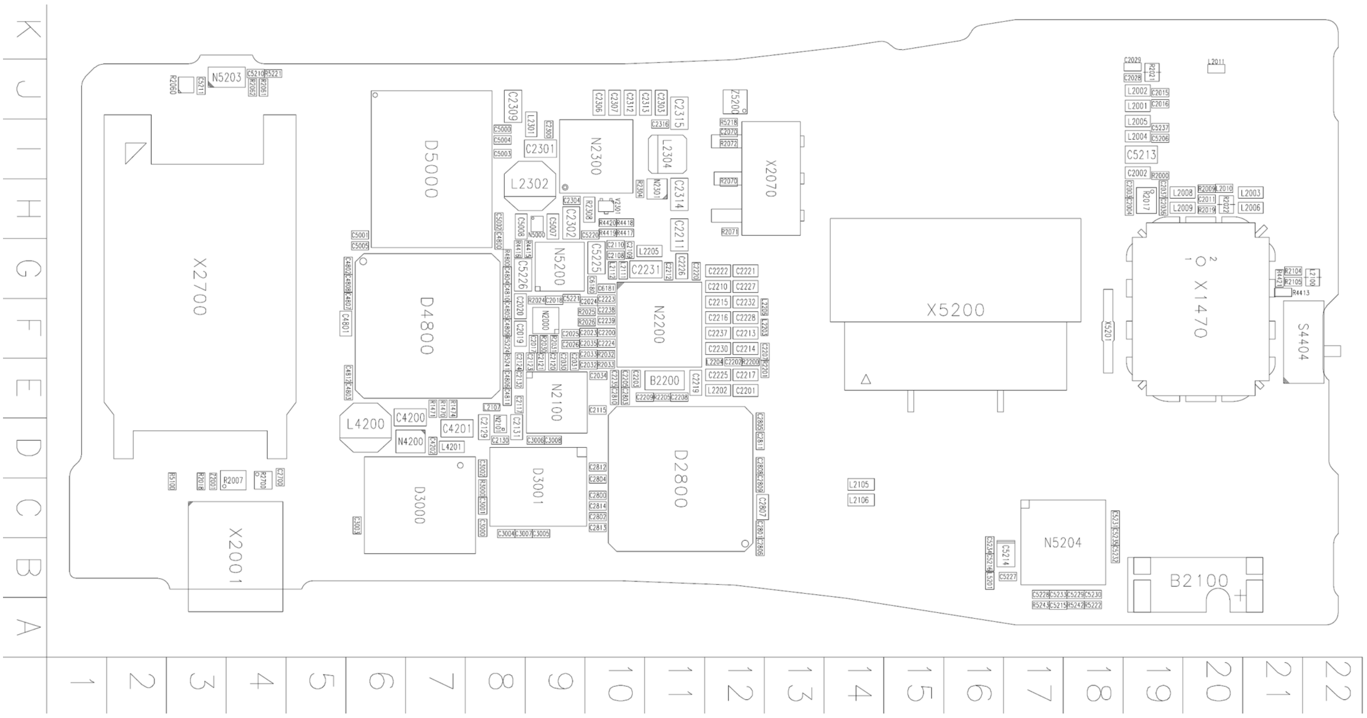
Item	Side	X	Y	Type	Description and Value		
Z4406	Top	E	10	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z4407	Top	E	2	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z4408	Top	I	5	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z4409	Top	C	5	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z4411	Top	G	2	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z4412	Top	H	2	FC6_1.65X1.15	ASIP 2-CH MIC EMI/ESD **PB-FREE**	~	~
Z5200	Bottom	J	12	FLIP_CHIP_16_2.01X2.02_H0.715	MMC ASP HIGH SPEED BGA16	~	~
Z6302	Top	C	13	FILTER_LFB322G	CER FILT 2450 +-50MHZ 3.2X2.5	2450MHz	~
Z7500	Top	D	16	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz	~
Z7501	Top	E	19	FILTER_SAW_2.1X1.7_H0.8	SAW FILTER 2140 +-30MHZ 2.0X1.6X1.0	2140MHz	~
Z7502	Top	I	19	DFYK61G95LBJCB	DUPL 1920-1980/2110-2170 MHZ 9X4.3	1920-1980/2110-2170 MHz	~

Item	Side	X	Y	Type	Description and Value		
Z7503	Top	C	19	ANT_SW_M 043B	ANT.SW +3SAW 880-960/1 710-1990M HZ	~	~
Z7504	Top	C	16	FILTER_SA W_2.1X1.7_ H0.8	SAW FILTER 897.5 +-17.5MHZ 2.0X1.6	897.5MHz	~
Z7505	Top	J	18	ISOLATOR_ CEZ0047	ISOLATOR 1950 +-30MHZ 13DB 3.3X3.4X1. 6	~	~
Z7506	Top	E	16	FILTER_SA W_2.1X1.7_ H0.8	SAW FILTER 1950 +-30MHZ 2.0X1.6X1. 0	1950MHz	~

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Component layouts

Component layout - bottom (1jy_21a)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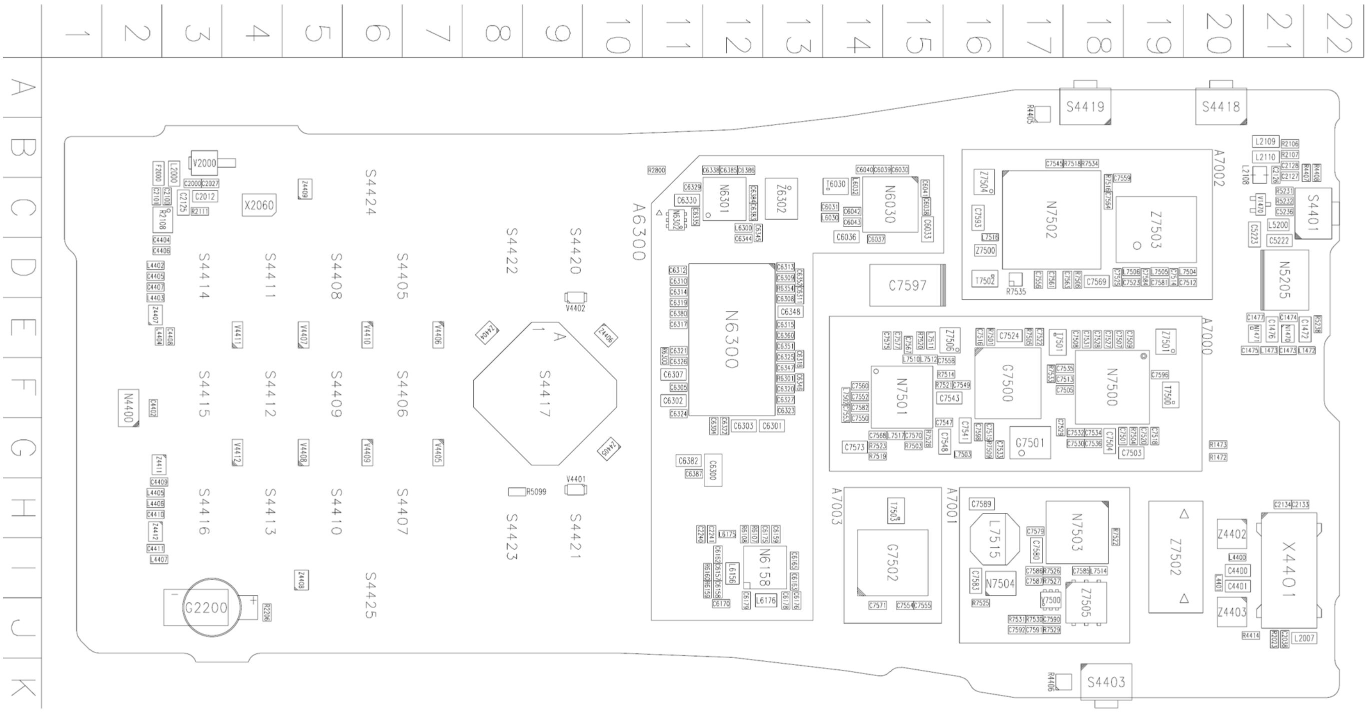
N5203
D5000
D4800
L2302
C2301
N2300
L2304
X2070
N5200
C2231
N2200
B2200
N2100
L4200
C4200
C4201
N4200
D3000
D3001
D2800
X2001
X5200
C5213
X1470
S4404
N5204
B2100

Component layout - top (1jy_21a)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S4418
S4401
N5205
A7002
N7502
Z7503
A7000
N7501
G7500
N7500
G7501
C7597
N6030
N6301
Z6302
A6300
N6300
N6158
S4424
S4422
S4420
S4414
S4411
S4408
S4405
S4415
S4412
S4409
S4406
S4417
S4416
S4413
S4410
S4407
S4423
S4421
S4425
X2060
V2000
N4400
G2200
A7003
A7001
G7502
L7515
N7503
N7504
Z7505
Z7502
Z4402
Z4403
X4401
S4403

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3 — Phoenix Service Software Instructions for BB5

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Table of Contents

Phoenix installation steps in brief....3–5
Installing Phoenix....3–6
Updating Phoenix installation....3–8
Uninstalling Phoenix....3–9
Repairing Phoenix installation....3–11
Phone data package overview....3–11
Installing phone data package....3–12
Uninstalling phone data package....3–15
Configuring users in Phoenix....3–17
Managing connections in Phoenix....3–17
Installing flash support files for FPS-8 and FPS-10....3–19
Updating FPS-8 and FPS-10 flash prommer software....3–22
Activating FPS-8....3–23
Deactivating FPS-8....3–24

List of Figures

Figure 2 Dongle not found....3–6
Figure 3 Disclaimer text....3–7
Figure 4 InstallShield Wizard Complete....3–8
Figure 5 Installation interrupted....3–9
Figure 6 Remove program....3–10
Figure 7 Finish uninstallation....3–10
Figure 8 Repair program....3–11
Figure 9 Data package setup information....3–13
Figure 10 Data package destination folder....3–14
Figure 11 InstallShield Wizard Complete....3–15
Figure 12 Uninstalling phone data package....3–16
Figure 13 Finishing data package uninstallation....3–16
Figure 14 Phoenix login....3–17
Figure 15 New user configured....3–17
Figure 16 Select mode: Manual....3–18
Figure 17 Connections list....3–19
Figure 18 Connection information....3–19
Figure 19 Product support module information (example from RM-1)....3–19
Figure 20 Flash update welcome dialog....3–20
Figure 21 Flash installation interrupted....3–20
Figure 22 Flash destination folder....3–21
Figure 23 Finish flash update....3–22
Figure 24 Flash directory window....3–22
Figure 25 Prommer software update finished....3–23
Figure 26 Prommer Maintenance window....3–23
Figure 27 Box activation....3–24
Figure 28 Deactivation warning....3–24

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Phoenix installation steps in brief

Before you begin

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 USB cable

Note: Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

Note: *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.
5. Manage connection settings (depends on the tools you are using).

If you use FPS-8:	• Update FPS-8 software • Activate FPS-8

If you use FPS-10:	• Update FPS-10 software **Note:** There is no need to activate FPS-10. • Activate SX-4 smart card, if you need tuning and testing functions. **Note:** When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

Results

Phoenix is ready to be used with FPS-8 or FPS-10 flash prommers and other service tools.

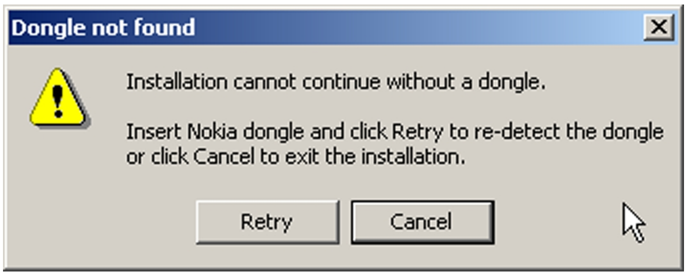
Installing *Phoenix*

Before you begin

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:



Installation cannot continue without a dongle.

Insert Nokia dongle and click Retry to re-detect the dongle or click Cancel to exit the installation.

Figure 2 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

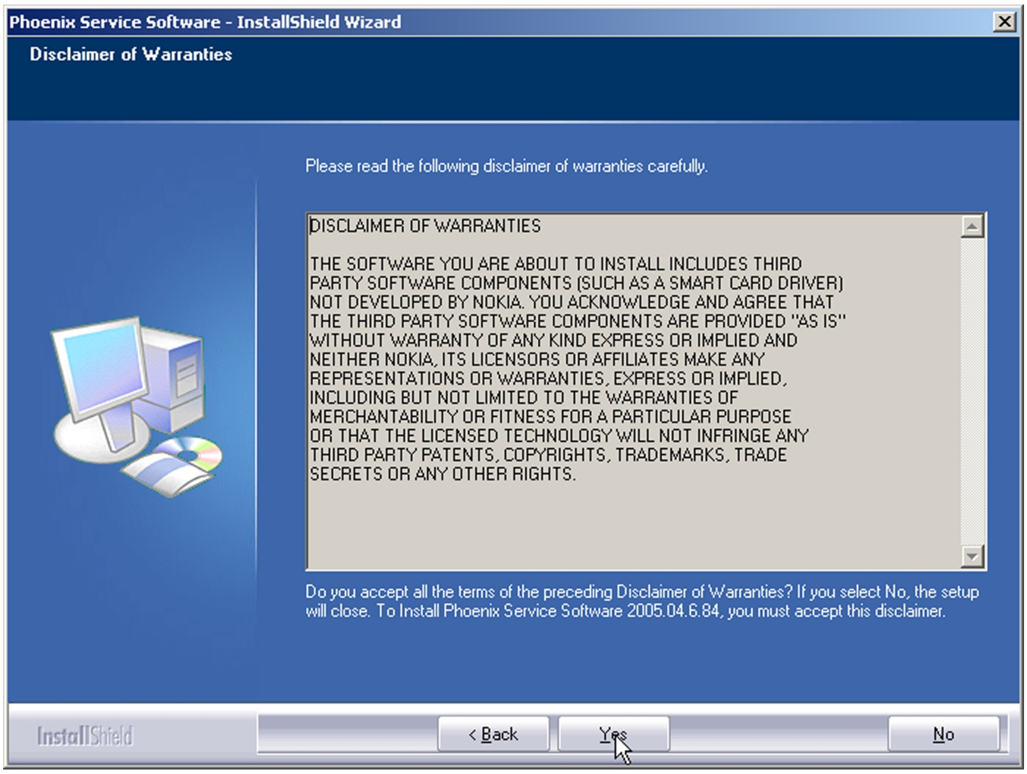
For more detailed information, please refer to *Phoenix* Help files.

> **Tip:** Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature's **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

3. Read the disclaimer text carefully and click **Yes**.



Please read the following disclaimer of warranties carefully.

DISCLAIMER OF WARRANTIES

THE SOFTWARE YOU ARE ABOUT TO INSTALL INCLUDES THIRD PARTY SOFTWARE COMPONENTS (SUCH AS A SMART CARD DRIVER) NOT DEVELOPED BY NOKIA. YOU ACKNOWLEDGE AND AGREE THAT THE THIRD PARTY SOFTWARE COMPONENTS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND EXPRESS OR IMPLIED AND NEITHER NOKIA, ITS LICENSORS OR AFFILIATES MAKE ANY REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR THAT THE LICENSED TECHNOLOGY WILL NOT INFRINGE ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS, TRADE SECRETS OR ANY OTHER RIGHTS.

Do you accept all the terms of the preceding Disclaimer of Warranties? If you select No, the setup will close. To Install Phoenix Service Software 2005.04.6.84, you must accept this disclaimer.

Figure 3 Disclaimer text

4. Choose the destination folder.

   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.

5. To continue, click **Next.**

   To choose another location, click **Browse** (not recommended).

6. Wait for the components to be copied.

   The progress of the installation is shown in the *Setup Status* window.

7. Wait for the drivers to be installed and updated.

   The process may take several minutes to complete.

   If the operating system does not require rebooting, the PC components are registered right away.

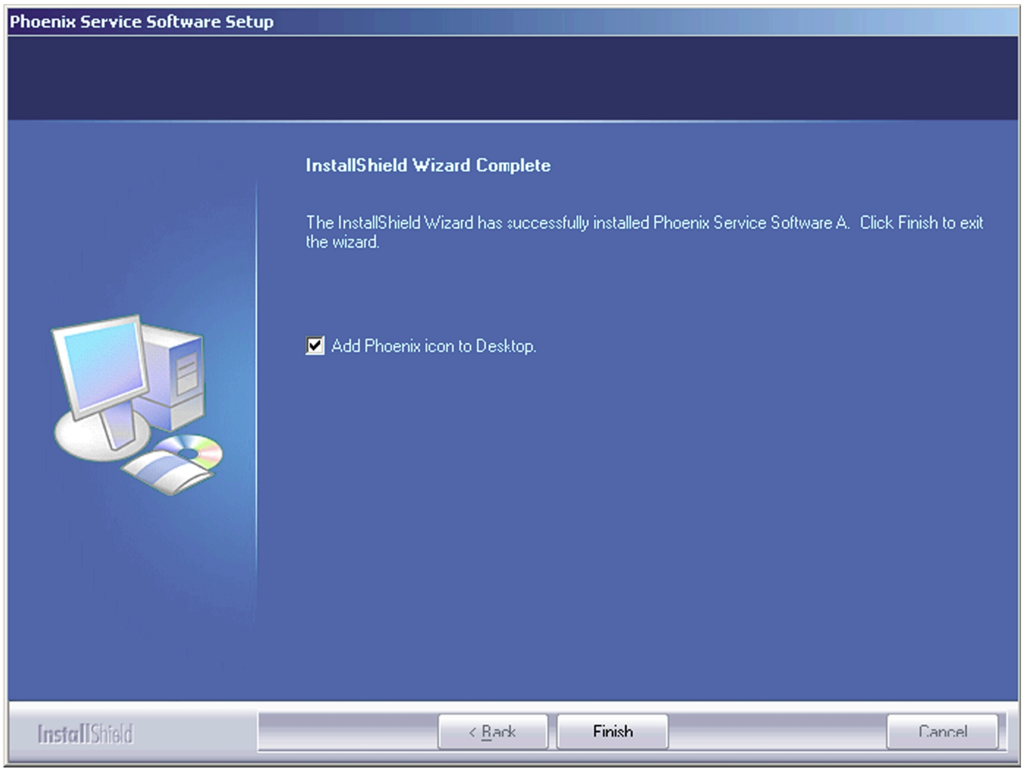
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.

   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.

   After the reboot, all components are registered.

   Note: *Phoenix* does not work, if the components have not been registered.

8. To end the installation, click **Finish**.



Phoenix Service Software Setup

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Phoenix Service Software A. Click Finish to exit the wizard.

☑ Add Phoenix icon to Desktop.

Figure 4 InstallShield Wizard Complete

Next action

After the installation, *Phoenix* can be used after:

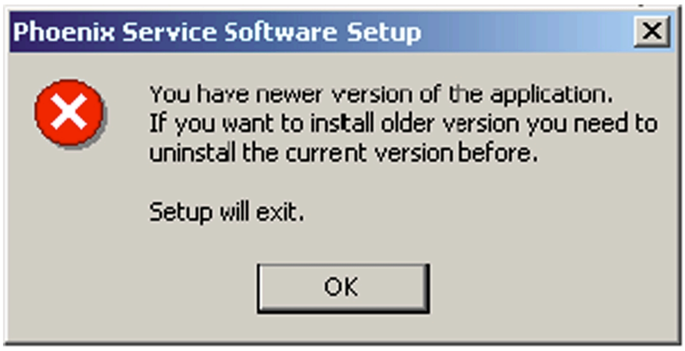
- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-8 and FPS-10 flash prommers can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.



You have newer version of the application.
If you want to install older version you need to uninstall the current version before.

Setup will exit.

Figure 5 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

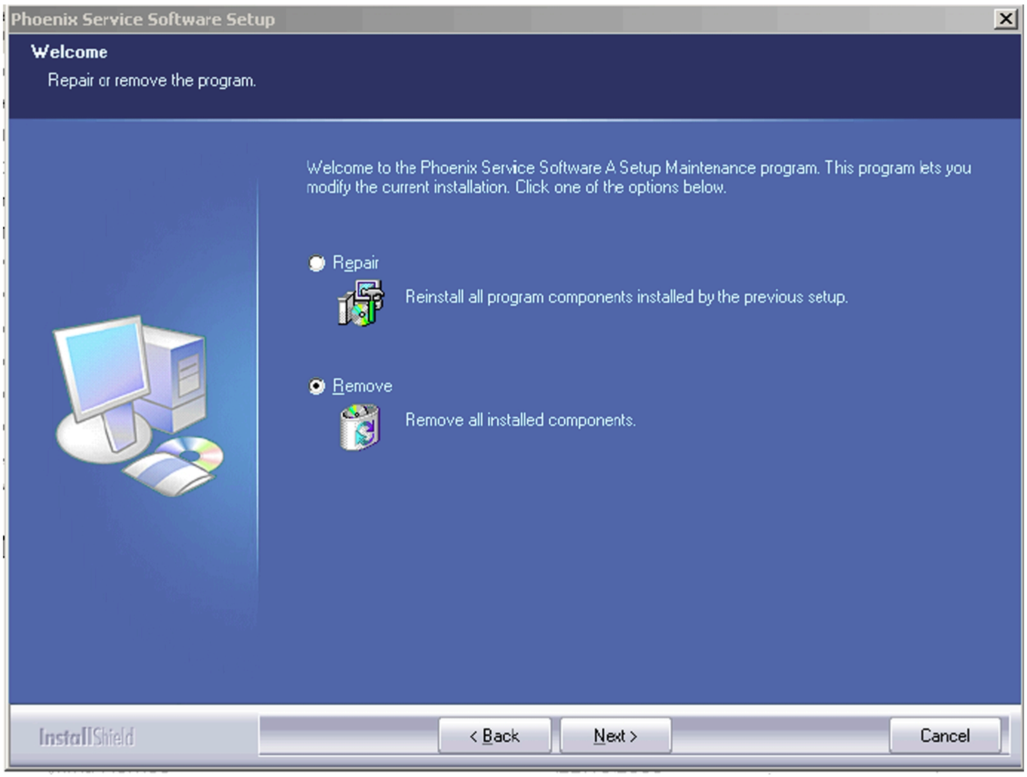
Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

○ Repair

Reinstall all program components installed by the previous setup.

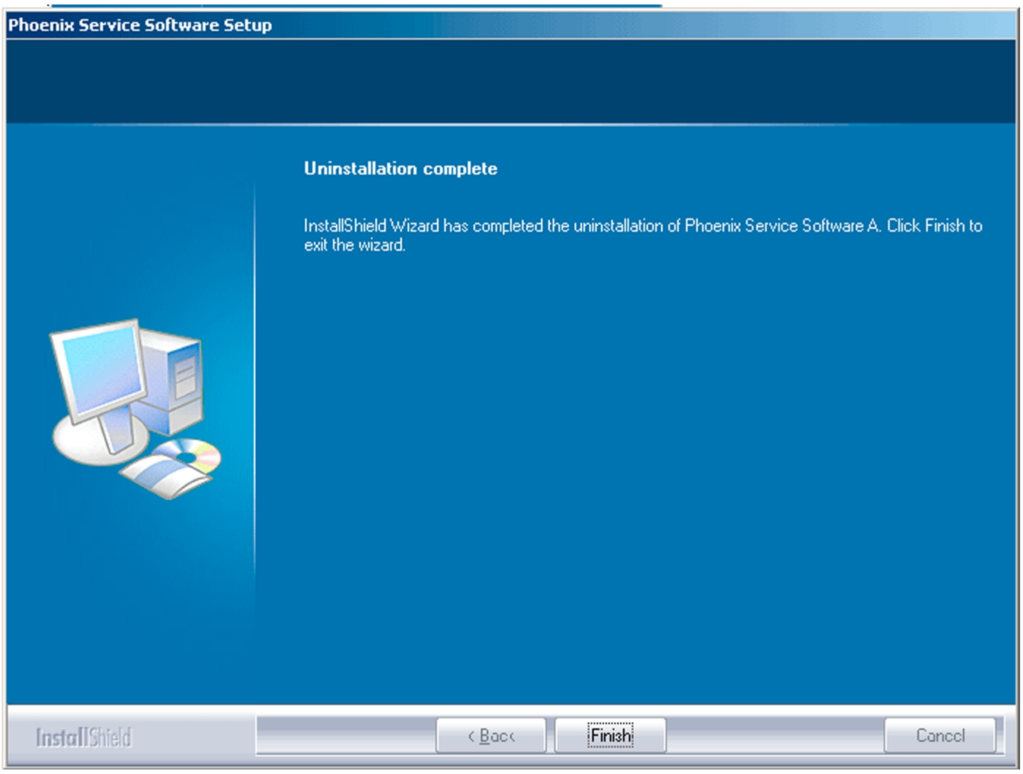
● Remove

Remove all installed components.

Figure 6 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.



Phoenix Service Software Setup

Uninstallation complete

InstallShield Wizard has completed the uninstallation of Phoenix Service Software A. Click Finish to exit the wizard.

Figure 7 Finish uninstallation

If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

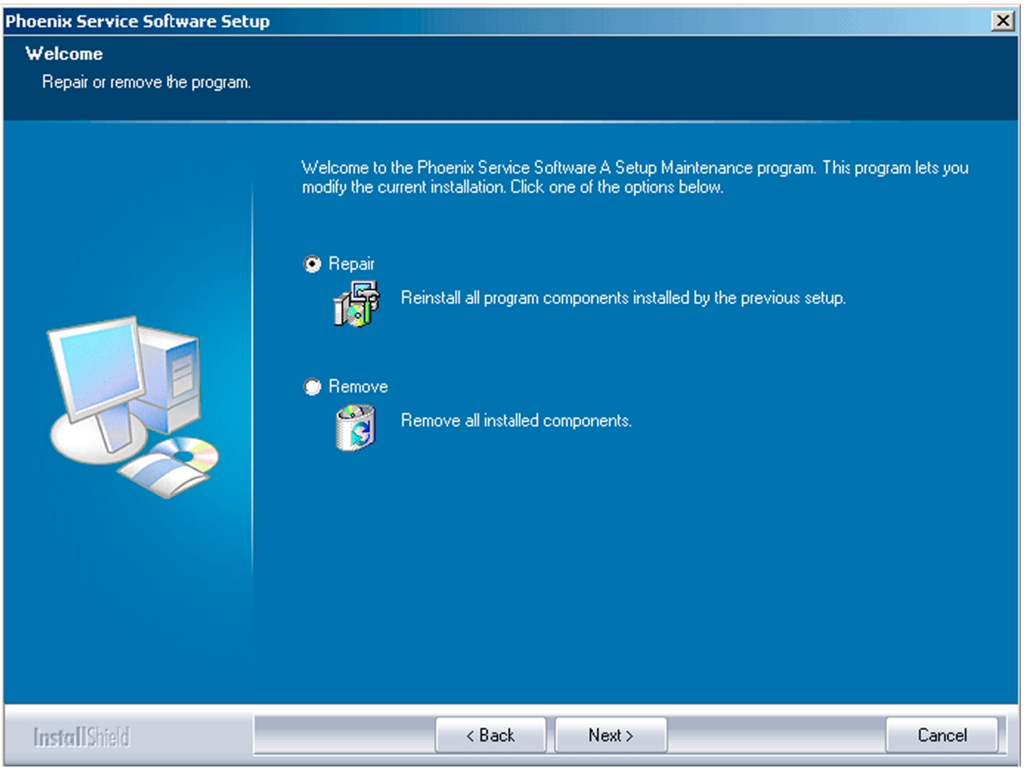
Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

> **Note:** The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

● Repair

Reinstall all program components installed by the previous setup.

○ Remove

Remove all installed components.

Figure 8 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Phone data package overview

Each product has its own data package (DP). The product data package contains all product-specific data files to make the Phoenix service software and tools usable with a certain phone model.

The phone data package contains the following:

- Product software binary files

- Files for type label printing
- Validation file for the fault log repair data reporting system
- All product-specific configuration files for Phoenix software components

Data files are stored in **C:\Program Files\Nokia\Phoenix** (default).

Installing phone data package

Before you begin

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.
- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

(XX-XX = type designator of the product)

If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

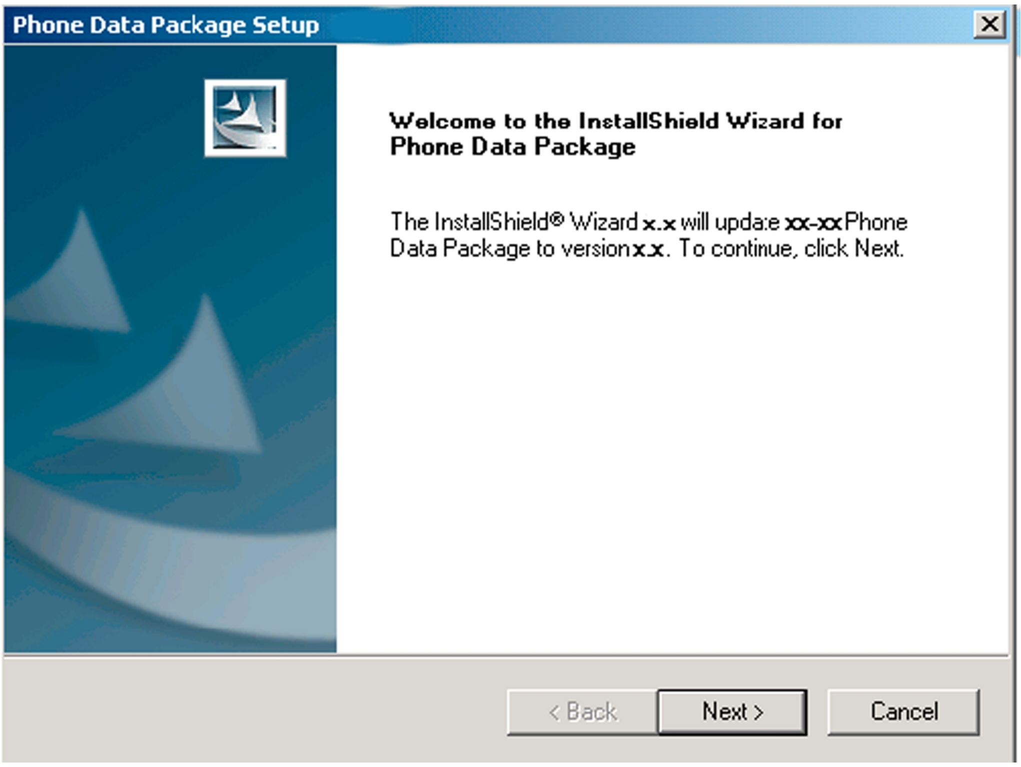
> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),

   Wait for the installation files to be extracted.

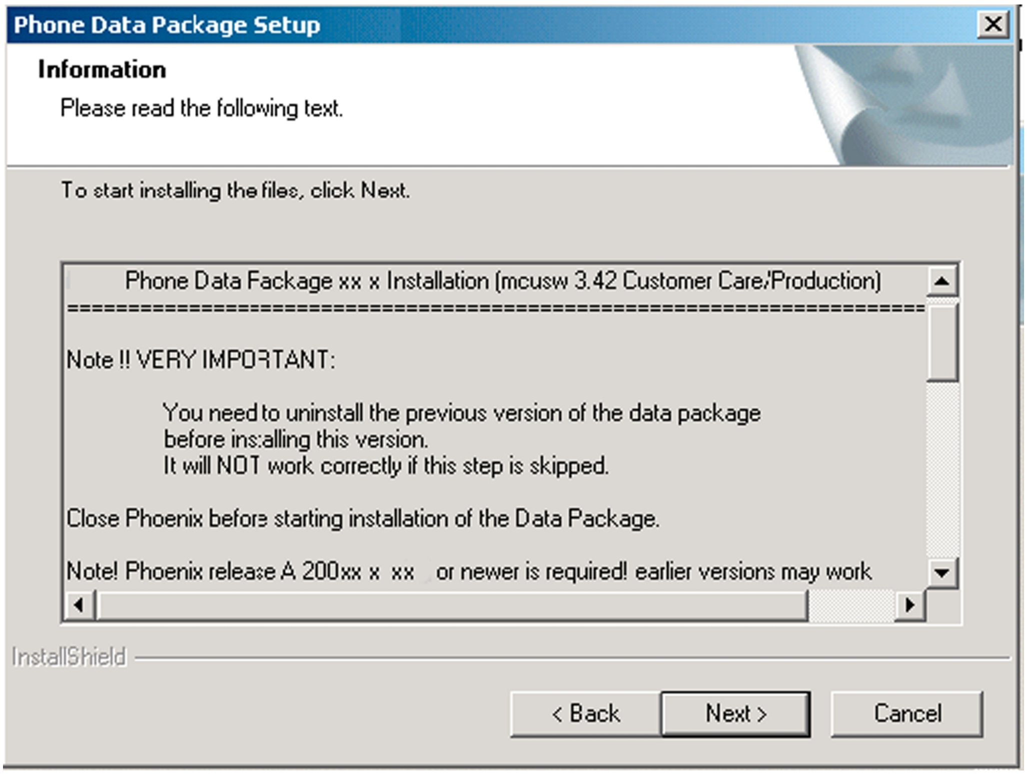
2. Click **Next**.



Welcome to the InstallShield Wizard for Phone Data Package

The InstallShield® Wizard **x.x** will update **xx-xx** Phone Data Package to version **x.x**. To continue, click Next.

3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.



Information

Please read the following text.

To start installing the files, click Next.

Phone Data Package xx x Installation (mcusw 3.42 Customer Care/Production)

===

Note !! VERY IMPORTANT:

You need to uninstall the previous version of the data package
before installing this version.
It will NOT work correctly if this step is skipped.

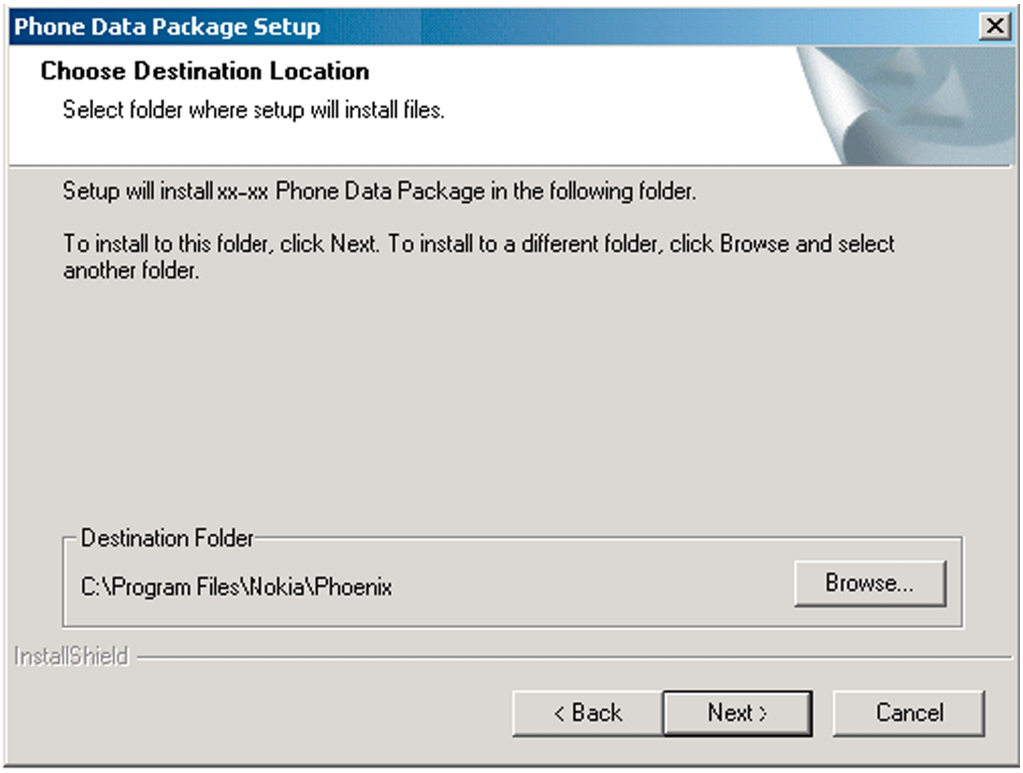
Close Phoenix before starting installation of the Data Package.

Note! Phoenix release A 200xx x xx or newer is required! earlier versions may work

Figure 9 Data package setup information

4. To continue, click **Next**.

5. Choose the destination folder, and click **Next** to continue.



Choose Destination Location

Select folder where setup will install files.

Setup will install xx-xx Phone Data Package in the following folder.

To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder

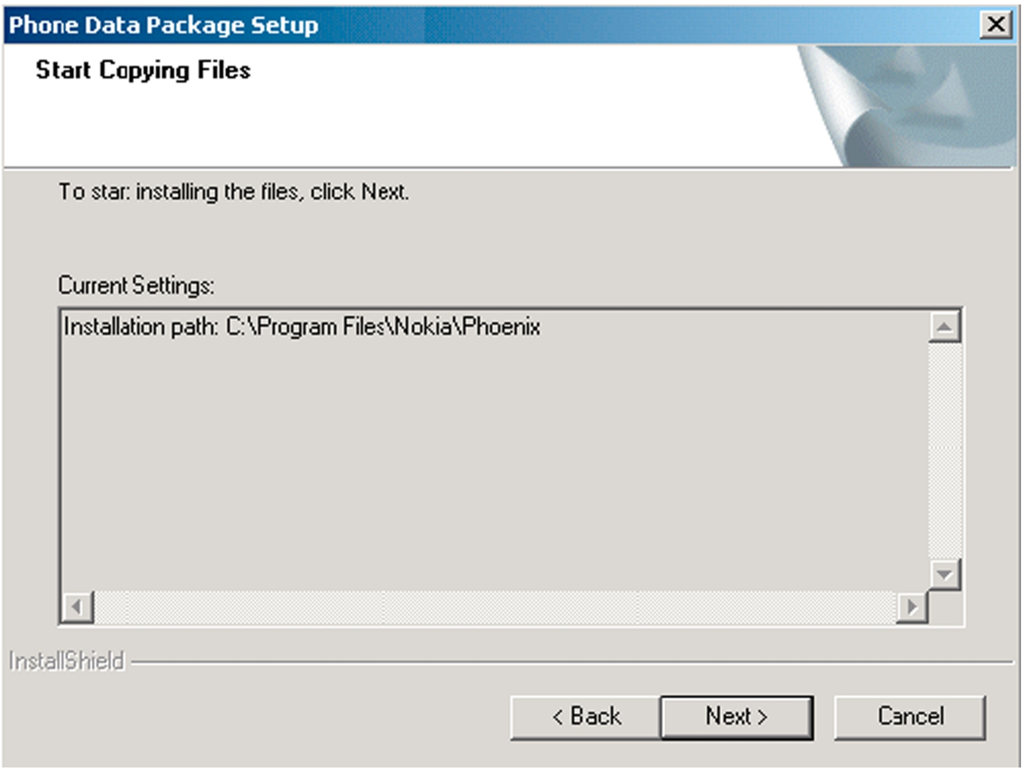
C:\Program Files\Nokia\Phoenix

Phone Data Package Setup
Browse...
InstallShield
< Back
Next >
Cancel

Figure 10 Data package destination folder

The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.



Start Copying Files

To start installing the files, click Next.

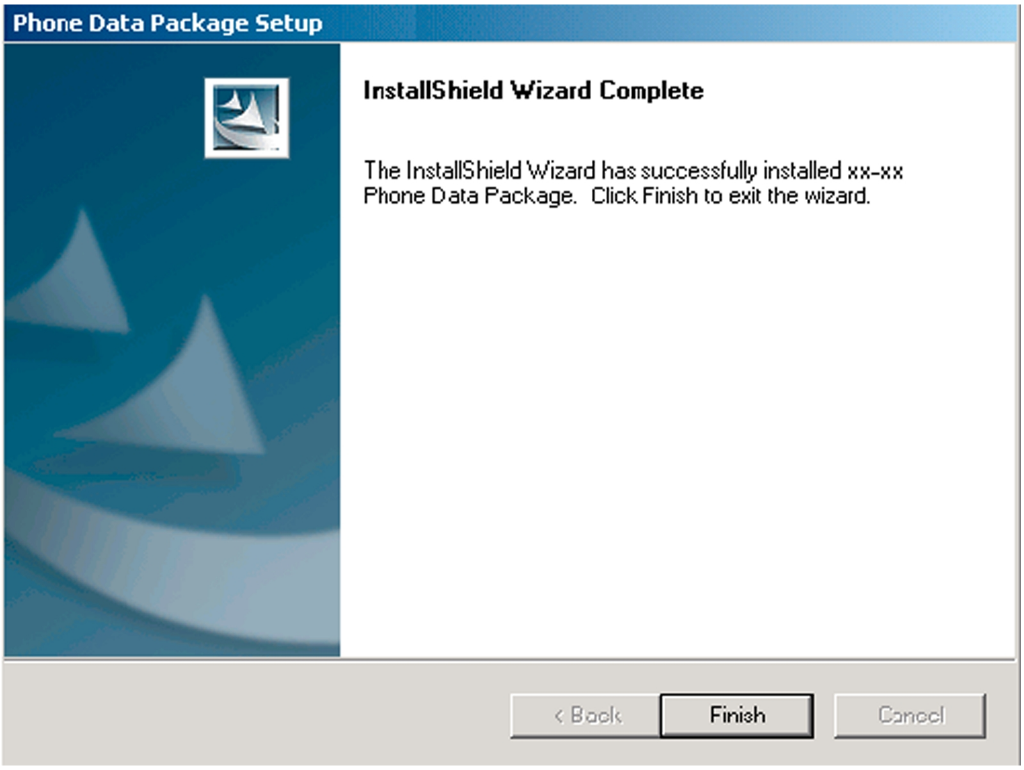
Current Settings:

Installation path: C:\Program Files\Nokia\Phoenix

Phone Data Package Setup
InstallShield
< Back
Next >
Cancel

Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.



Phone Data Package Setup

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 11 InstallShield Wizard Complete

Next action

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-8 and FPS-10 can be used after updating their flash update package files.

Uninstalling phone data package

Context

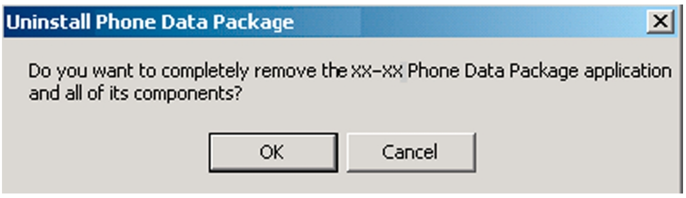
There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.

3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.

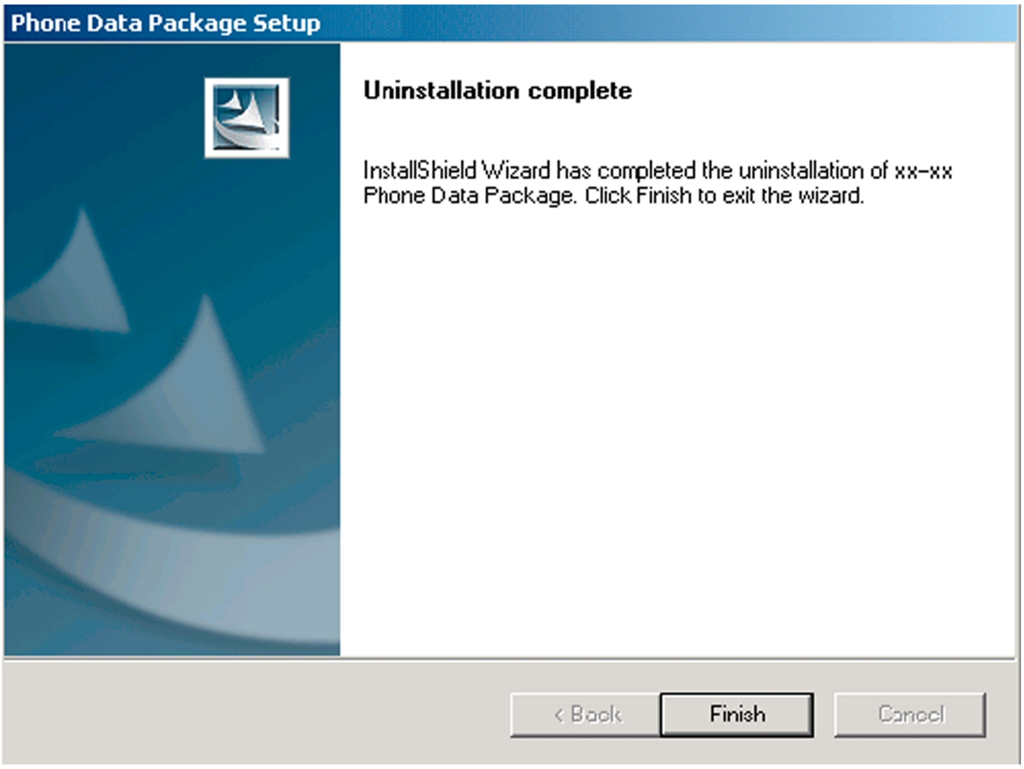


Uninstall Phone Data Package
OK
Cancel

Do you want to completely remove the xx-xx Phone Data Package application and all of its components?

Figure 12 Uninstalling phone data package

4. When the data package is uninstalled, click **Finish**.



Phone Data Package Setup
< Back
Finish
Cancel

Uninstallation complete

InstallShield Wizard has completed the uninstallation of xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 13 Finishing data package uninstallation

Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.

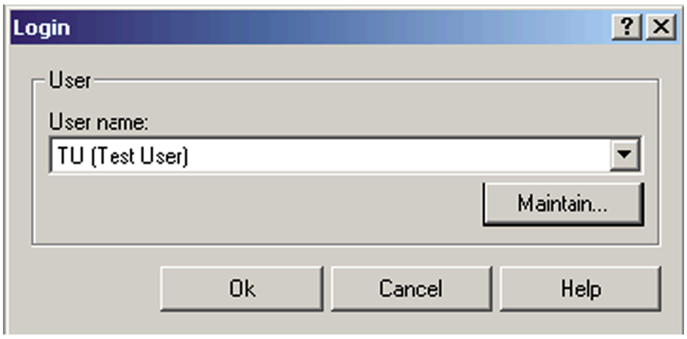


Figure 14 Phoenix login

If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.

2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.
4. Type in the name and initials of the user, and click **OK**.
   The user is added to the user name list.
5. Select the desired user from the *User name* drop-down list, and click **OK**.

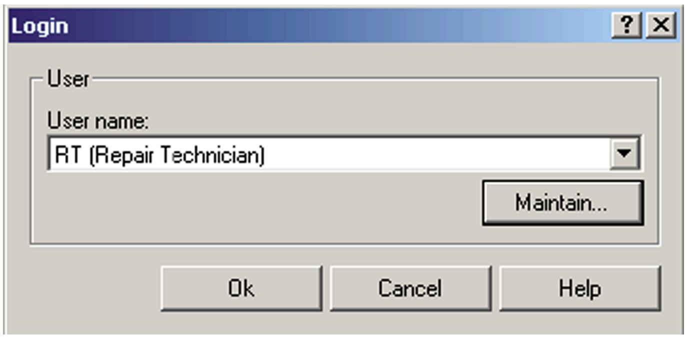


Figure 15 New user configured

Managing connections in *Phoenix*

Context

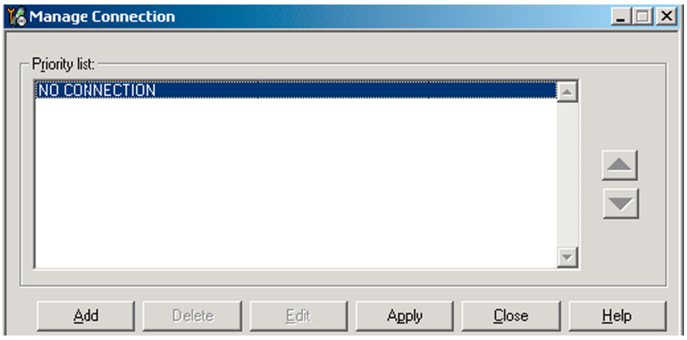
With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

Steps

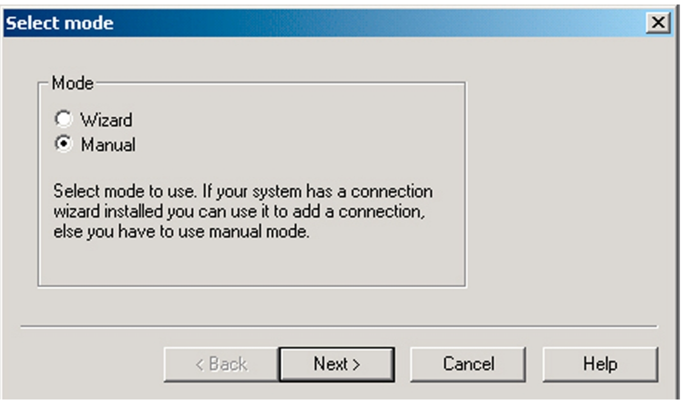
1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .

3. To add a new connection, click **Add**.



4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.



○ Wizard
● Manual

Select mode to use. If your system has a connection wizard installed you can use it to add a connection, else you have to use manual mode.

Figure 16 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:

- Media: **FPS-10 USB**
- DEVICE_INDEX: **0**
- SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
- ACTIVE_MEDIA: **USB**

ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:

- Media: **FPS-10 TCP/IP**
- NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
- PORT_NUM: Use the default value, and click **Next**.
- PROTOCOL_FAMILY: Use the default value, and click **Next**.
- SOCKET TYPE: Use the default value, and click **Next**.
- TX_BUFFER_SIZE: Use the default value, and click **Next**.
- RX_BUFFER_SIZE: Use the default value, and click **Next**.

iii For an FPS-8 flash prommer, choose the following connection settings:

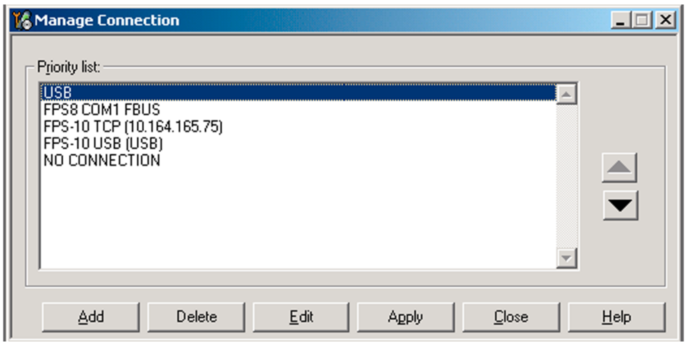
- Media: FPS-8
- PORT_NUM: COM Port where FPS-8 is connected
- COMBOX_DEF_MEDIA: **FBUS**

iv For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 USB cable between the PC USB port and phone.

- Media: USB

5. To complete the configuration, click **Finish**.
6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.



Priority list:

USB
FPS8 COM1 FBUS
FPS-10 TCP (10.164.165.75)
FPS-10 USB (USB)
NO CONNECTION

Figure 17 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

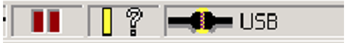
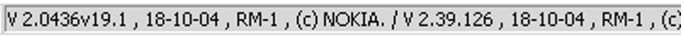


Figure 18 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:



V 2.0436v19.1 , 18-10-04 , RM-1 , (c) NOKIA. / V 2.39.126 , 18-10-04 , RM-1 , (c

Figure 19 Product support module information (example from RM-1)

Installing flash support files for FPS-8 and FPS-10

Before you begin

- Install *Phoenix* service software.
- Install phone model specific data package for *Phoenix*.
- If you want to update the flash support files, they are delivered in the same installation package with *Phoenix* or newer *Phoenix* packages beginning from December 2004.

  In case you want to update the MCU files, install the latest data package (see Technical Bulletins for information on the latest one).

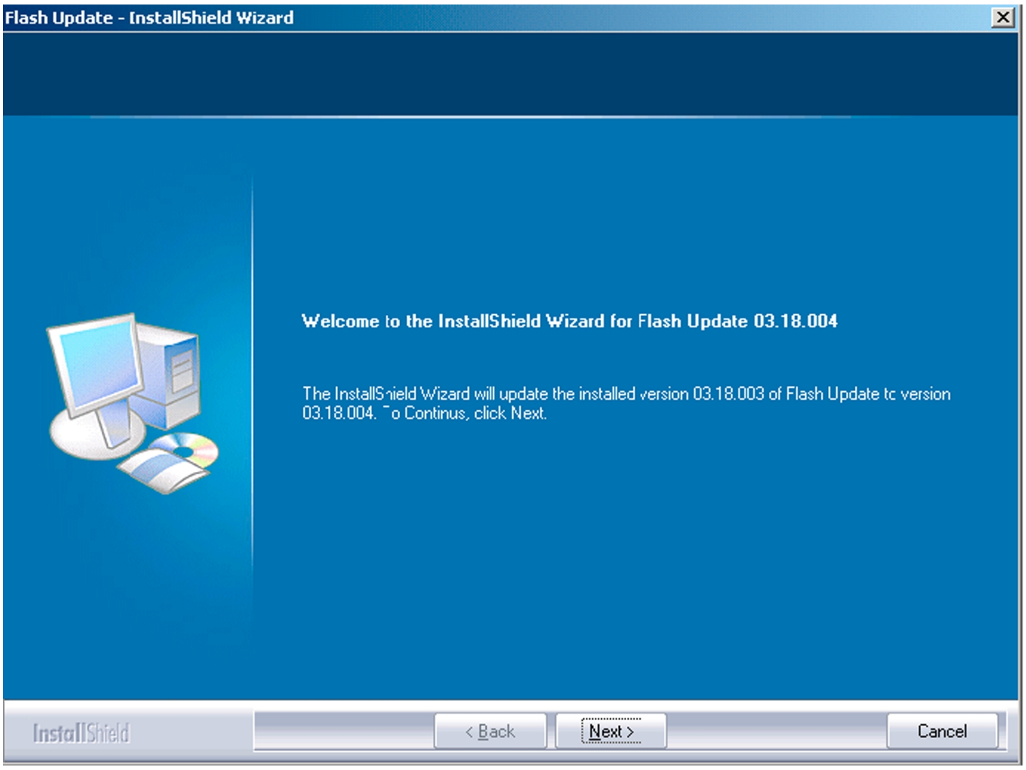
  Normally, it is enough to install *Phoenix* and the phone-specific data package because the installation always includes the latest flash update package files for FPS-8 and FPS-10.
- A separate installation package for flash support files is available. The files can be updated according to these instructions, if updates appear between *Phoenix* data package releases.

Context

If you are not using a separate installation package, you can skip this section and continue with "Updating FPS-8 and FPS-10 flash prommer software" (page 3–22) after installing a new phone data package.

Steps

1. To begin the installation, double-click the flash update file (for example, *flash_update_03_183_0014.exe*).


Flash Update - InstallShield Wizard

Welcome to the InstallShield Wizard for Flash Update 03.18.004

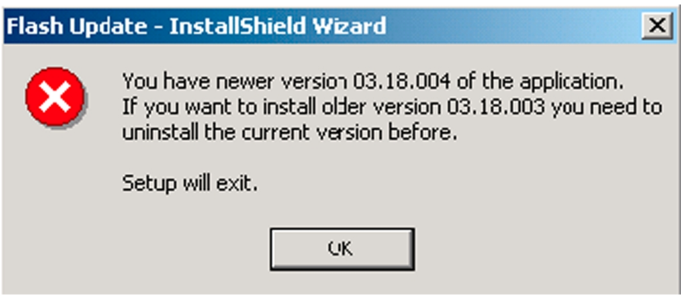
The InstallShield Wizard will update the installed version 03.18.003 of Flash Update to version 03.18.004. To Continue, click Next.

Figure 20 Flash update welcome dialog

If the same version of the flash update package already exists, and you want to reinstall it, the previous package is first uninstalled.

Restart installation again after the uninstallation.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If there is a need to downgrade the version, uninstall newer files manually from the **Windows Control Panel**, and then rerun the installation.


Flash Update - InstallShield Wizard

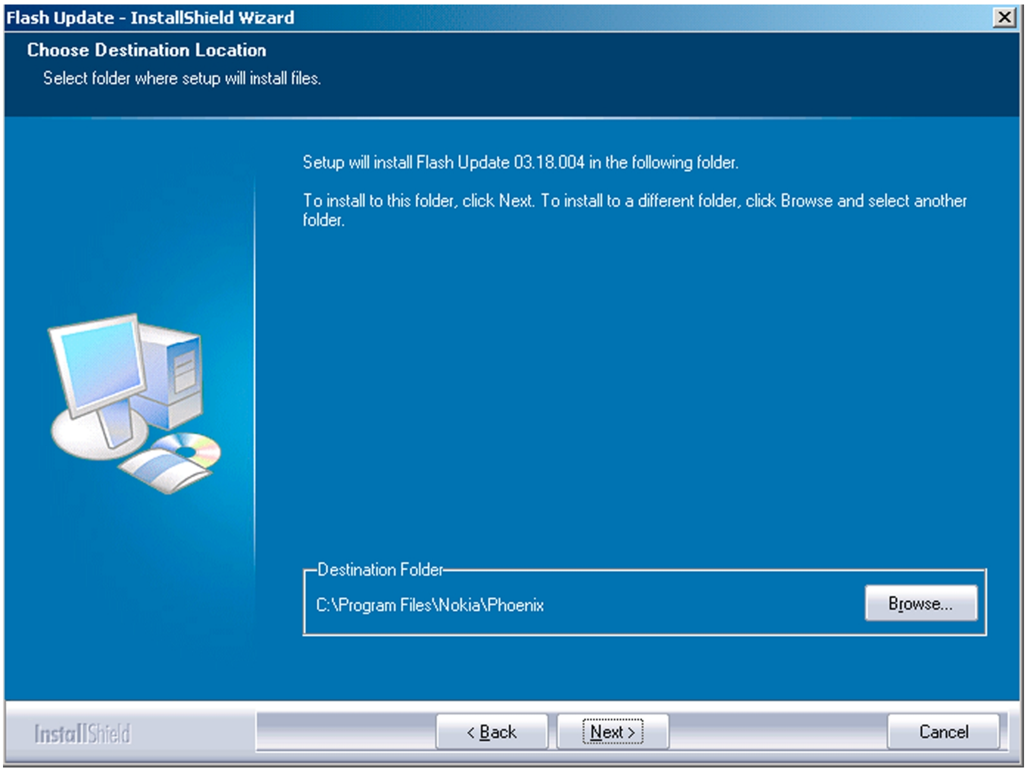
You have newer version 03.18.004 of the application.
If you want to install older version 03.18.003 you need to uninstall the current version before.

Setup will exit.

Figure 21 Flash installation interrupted

If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

3. It is recommended to install the files to the default destination folder *C:|Program Files|Nokia|Phoenix*. To continue, click **Next**.



Flash Update - InstallShield Wizard

Choose Destination Location

Select folder where setup will install files.

Setup will install Flash Update 03.18.004 in the following folder.

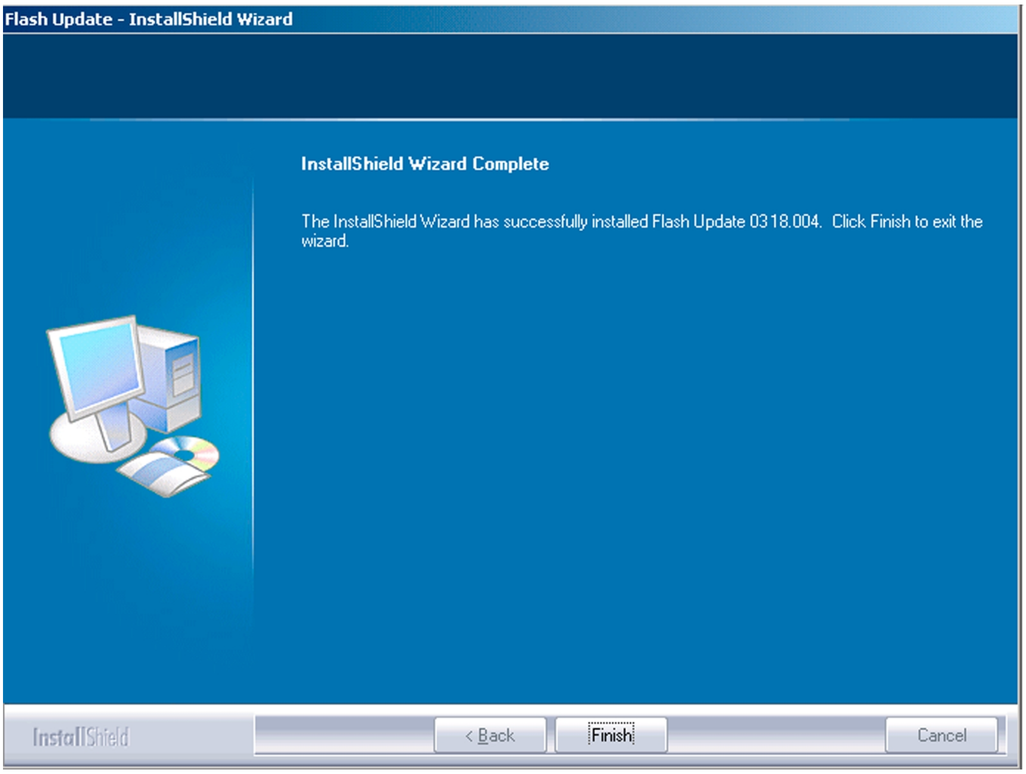
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder: C:\Program Files\Nokia\Phoenix

Figure 22 Flash destination folder

When installing the flash update files for the first time, you may choose another location by selecting **Browse** (not recommended).

4. To complete the installation procedure, click **Finish** .



Flash Update - InstallShield Wizard

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Flash Update 0318.004. Click Finish to exit the wizard.

Figure 23 Finish flash update

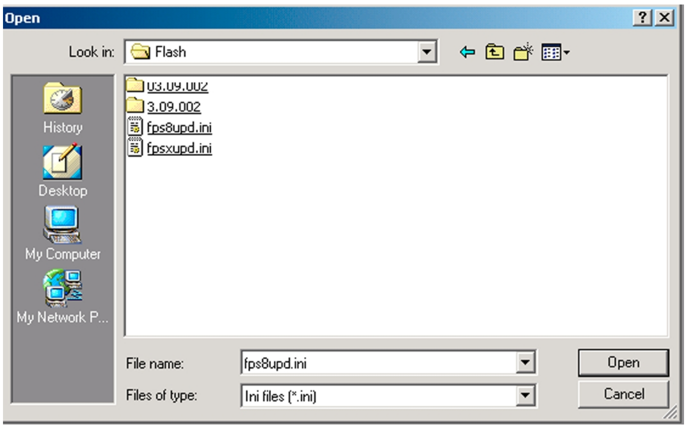
Next action

FPS-8 and FPS-10 flash prommers must be updated using *Phoenix*.

Updating FPS-8 and FPS-10 flash prommer software

Steps

1. Start *Phoenix* service software, and log in.
2. Choose the correct connection for your flash prommer: **File→Manage Connections...**
3. Choose **Flashing→Prommer maintenance** .
4. To update the **FPS-8/FPS-10** software, click **Update**, and select the appropriate file *fps8upd.ini* (for FPS-8) or *fpsxupd.ini* (for FPS-10) from *C:|Program Files|Nokia|Phoenix|Flash*.



Open

Look in: Flash

03.09.002
3.09.002
fps8upd.ini
fpsxupd.ini

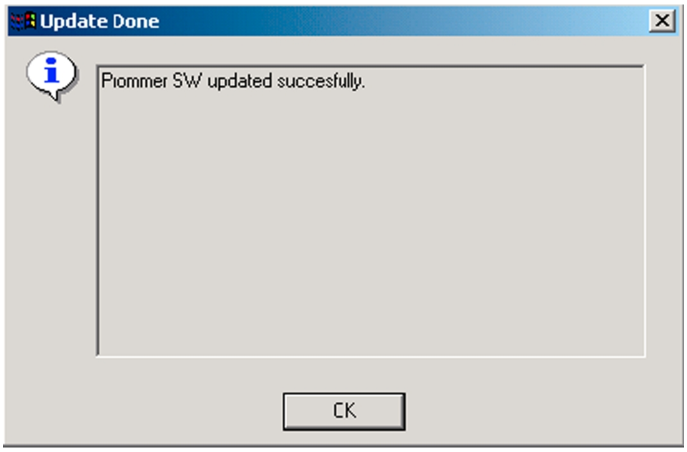
File name: fps8upd.ini

Files of type: Ini files (*.ini)

Figure 24 Flash directory window

Tip: All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash Box Files* pane and select the file type(s) to be loaded.

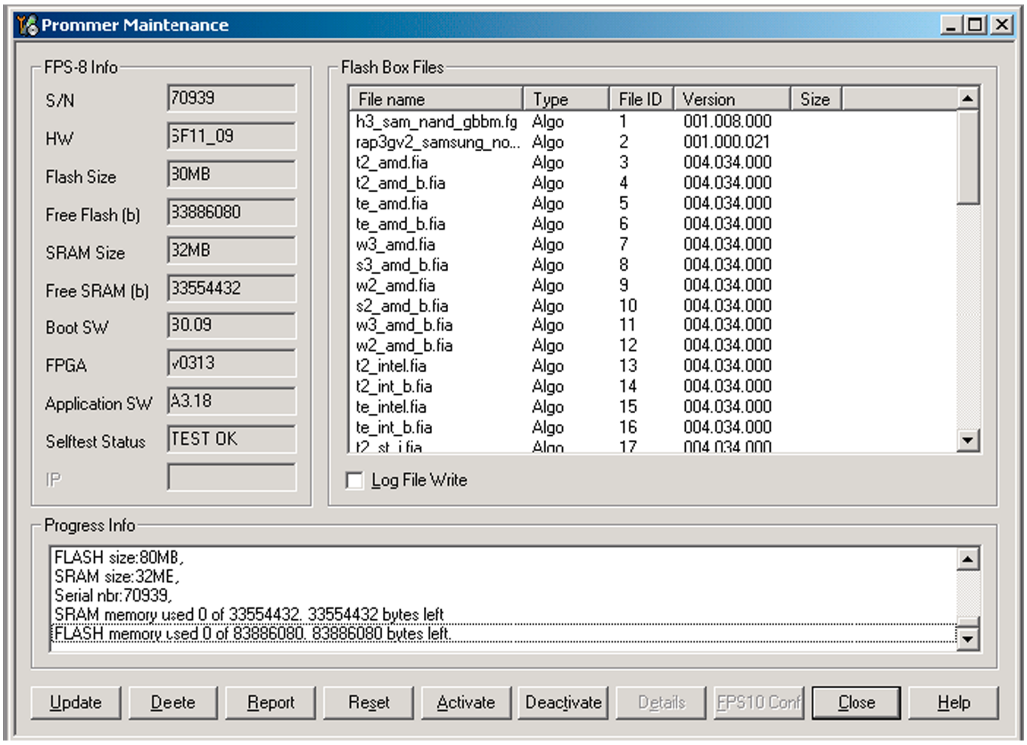
5. Click **OK**.



Prommer SW updated succesfully.

Figure 25 Prommer software update finished

6. To close the *Prommer Maintenance* window, click **Close**.



S/N	70939
HW	SF11_09
Flash Size	80MB
Free Flash (b)	83886080
SRAM Size	32MB
Free SRAM (b)	33554432
Boot SW	30.09
FPGA	v0313
Application SW	A3.18
Selftest Status	TEST OK
IP	

File name	Type	File ID	Version	Size
h3_sam_nand_gbbm.fg	Algo	1	001.008.000	
rap3gv2_samsung_no...	Algo	2	001.000.021	
t2_amd.fia	Algo	3	004.034.000	
t2_amd_b.fia	Algo	4	004.034.000	
te_amd.fia	Algo	5	004.034.000	
te_amd_b.fia	Algo	6	004.034.000	
w3_amd.fia	Algo	7	004.034.000	
s3_amd_b.fia	Algo	8	004.034.000	
w2_amd.fia	Algo	9	004.034.000	
s2_amd_b.fia	Algo	10	004.034.000	
w3_amd_b.fia	Algo	11	004.034.000	
w2_amd_b.fia	Algo	12	004.034.000	
t2_intel.fia	Algo	13	004.034.000	
t2_int_b.fia	Algo	14	004.034.000	
te_intel.fia	Algo	15	004.034.000	
te_int_b.fia	Algo	16	004.034.000	
t2_st_i.fia	Algo	17	004.034.000	

```
FLASH size:80MB,
SRAM size:32ME,
Serial nbr:70939,
SRAM memory used 0 of 33554432. 33554432 bytes left
FLASH memory used 0 of 83886080. 83886080 bytes left.
```

Figure 26 *Prommer Maintenance* window

Activating FPS-8

Context

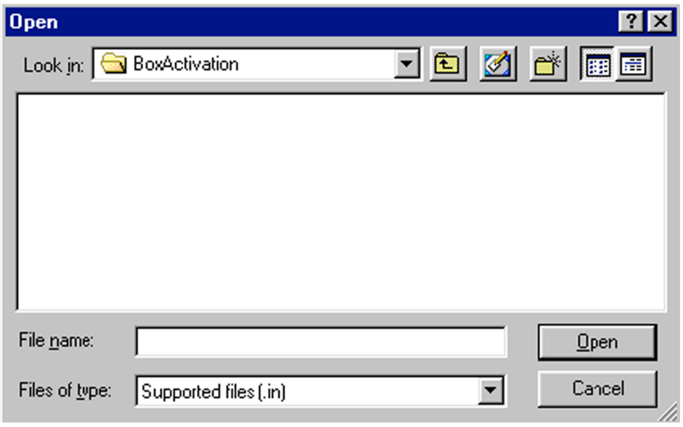
Before FPS-8 can be successfully used for phone programming, it must first be activated.

First fill in the *FPS-8 activation request* sheet in the FPS-8 sales package, and follow the instructions given.

When activation file is received (for example, *00000.in*), copy it to the *C:|ProgramFiles|Nokia|Phoenix |BoxActivation* directory on your computer (this directory is created when *Phoenix* is installed).

Steps

1. Start *Phoenix* service software.
2. Choose **Flashing→Prommer Maintenance** .
3. In the *Prommer Maintenance* window, click **Activate**.
4. To find the activation file, click **Browse**.
5. To activate the prommer, select the activation file and click **Open**.



Look in: BoxActivation

File name:

Files of type: Supported files (.in)

Figure 27 Box activation

6. To complete the activation, restart FPS-8.

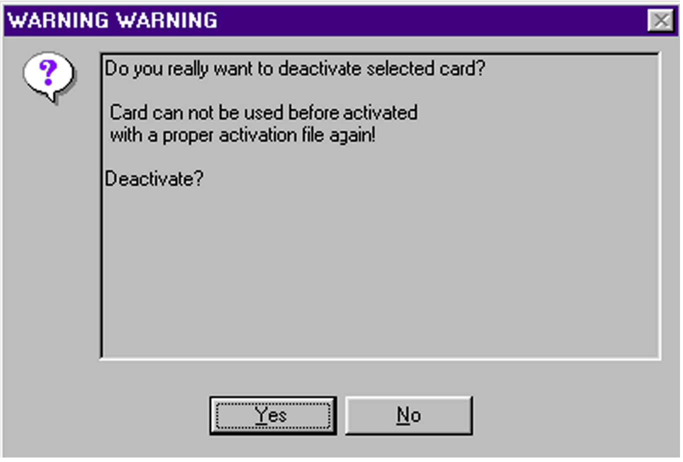
Deactivating FPS-8

Context

If there is, for example, a need to send the FPS-8 box for repair, it must be deactivated first.

Steps

1. Start *Phoenix* service software.
2. Choose **Flashing→Prommer Maintenance** .
3. In the *Prommer Maintenance* window, click **Deactivate**.
4. To confirm the deactivation, click **Yes**.



WARNING WARNING

Do you really want to deactivate selected card?

Card can not be used before activated
with a proper activation file again!

Deactivate?

Figure 28 Deactivation warning

The box is deactivated.

5. To complete the deactivation, restart FPS-8.

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4 — Service Tools and Service Concepts

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Table of Contents

New service tools....4–5
FS-7....4–5
MJ-78....4–6
RJ-85....4–6
SA-89....4–7
SS-63....4–7
Common service tools....4–8
CA-31D....4–8
CA-35S....4–8
CU-4....4–9
DKE-2....4–10
FLS-4S....4–10
FPS-10....4–10
JBT-9....4–11
PCS-1....4–11
PKD-1....4–11
RF shield box....4–11
RJ-105....4–12
RJ-106....4–12
RJ-56....4–12
SB-6....4–12
SB-7....4–13
SPI-1....4–13
SPS-1....4–13
SRT-6....4–13
SS-15....4–13
SS-46....4–14
ST-21....4–14
ST-38....4–14
ST-39....4–14
SX-4....4–15
XCS-1....4–15
XCS-4....4–15
XRS-6....4–15
Service concepts....4–16
Flash concept with FPS-10 and LAN....4–16
MJ-78 module jig concept....4–17
POS (Point of Sale) flash concept....4–18
Service concept for RF/BB testing and tuning....4–19
CU-4 flash concept with FPS-10....4–20
RF testing and BB testing/tuning....4–21

List of Tables

Table 10 MJ-78 RF attenuations....4–6
Table 11 SA-89 attenuations....4–7

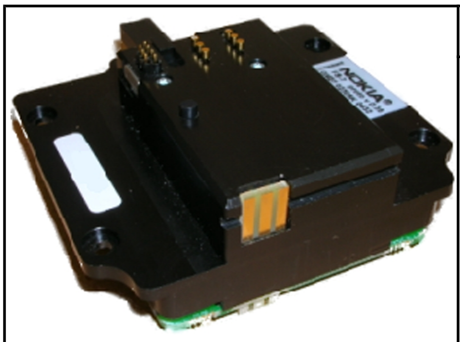
List of Figures

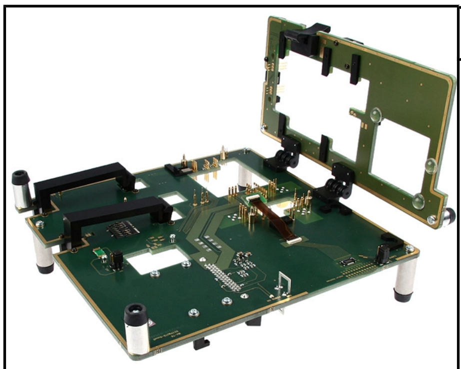
Figure 29 Basic flash concept with FPS-10....4–16

Figure 30 MJ-78 module jig service concept....4–17
Figure 31 POS flash concept....4–18
Figure 32 Service concept for RF/BB testing and tuning....4–19
Figure 33 CU-4 flash concept with FPS-10....4–20
Figure 34 RF testing and BB testing/tuning....4–21

New service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-43, refer to various concepts.

	FS-7	Flash adapter	
	Flash adapter FS-7 is used for phone testing and flashing. FS-7 is used with the generic flash adapter base SS-62 and control Unit CU-4 or interface adapter SS-46. When flashing or system testing the phone, the adapter is attached to replace the phone own battery. All functions (as well as the calibration voltages, current and the protections for over voltages, over current and voltage polarity), are performed by CU-4. Flash adapter FS-7 main features: • VBATT supply interface • USB / FBUS multiplexed interface to the phone • Supply voltage for light source		



MJ-78	Module jig	

Module jig MJ-78 is designed for engine and electromechanical testing. It can be used for flashing, system level testing, and testing the functionality of RF and the battery.

MJ-78 provides the following functionalities:

- CU-4 interface adapter to phone
- USB/FBUS multiplexed interface to phone
- UI interface to phone
- STI and XTI test interface
- WCDMA, GSM, BT and WLAN interface.

All functions, except USB/FBUS multiplexing, are performed in CU-4. For instance, adjusting calibration voltage and current, and all protections for over current, over voltage and voltage polarity.

- **Table 10 MJ-78 RF attenuations**

Frequency (MHz)	Attenuation (dB)
836.6	0.14
881.6	0.10
897.4	0.17
942.4	0.12
1747.8	0.45
1842.8	0.48
1880	0.45
1950	0.88
1960	0.53
2140	0.67
2450	1.23

RJ-85	Soldering jig	

RJ-85 is a soldering jig used for soldering and as a rework jig for the engine module.

SA-89 RF coupler

SA-89 is an RF coupler for WCDMA and GSM RF testing. It is used together with a product-specific flash adapter.

Table 11 SA-89 attenuations

GSM900 Tx (MHz)	Att. (dB)	GSM900 Rx (MHz)	Att(dB)
880	3.9	925	7.9
897	3.8	942	6.7
915	4.5	960	8.6

GSM1800 Tx (MHz)	Att. (dB)	GSM1800 Rx (MHz)	Att(dB)
1710	8	1805	7.9
1748	9	1843	9.7
1785	9.3	1880	9.6

GSM1900 Tx (MHz)	Att. (dB)	GSM1900 Rx (MHz)	Att(dB)
1850	9.2	1930	10.5
1880	9	1960	12.3
1910	9	1990	10.3

WCDMA Tx (MHz)	Att. (dB)	WCDMA Rx (MHz)	Att(dB)
1930	7.3	2120	9.9
1950	7.1	2140	10.2
1977	7.4	2167	10.5

SS-63 Domesheet alignment tool

SS-63 is used to align the domesheet for installation on the PWB.

Common service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-43, refer to various concepts.

<table>
<tr><td rowspan="2"> </td><td>CA-31D</td><td>USB cable</td><td></td></tr>
<tr><td colspan="3">The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.</td></tr>
<tr><td rowspan="2"> </td><td>CA-35S</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.</td></tr>
</table>

	CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

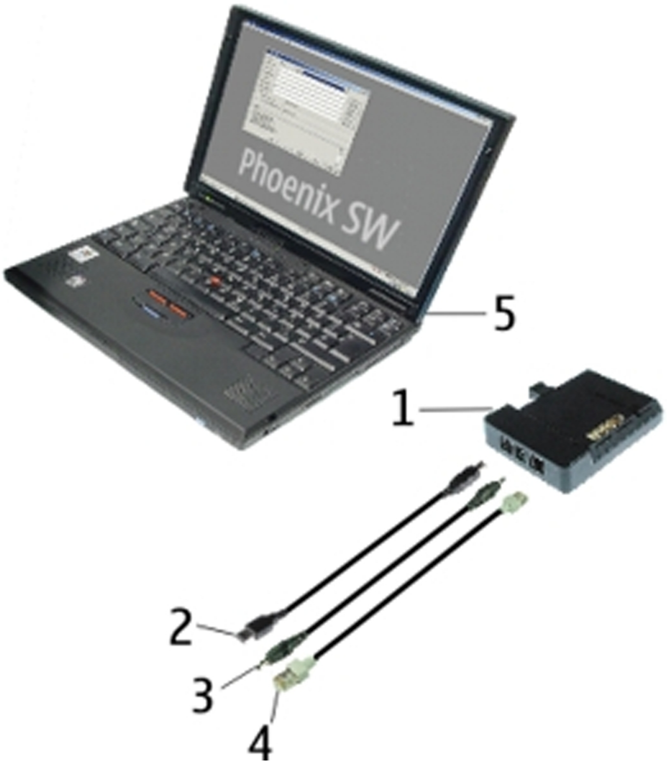
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

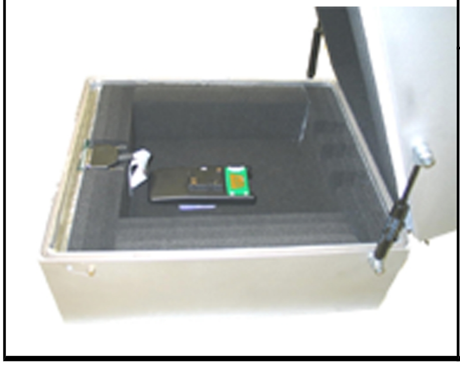
1 Connect a service tool (jig, flash adapter) to CU-4.
2 Connect CU-4 to your PC with a USB cable.
3 Connect supply voltage (12 V)
4 Connect an FBUS cable (if necessary).
5 Start Phoenix service software.

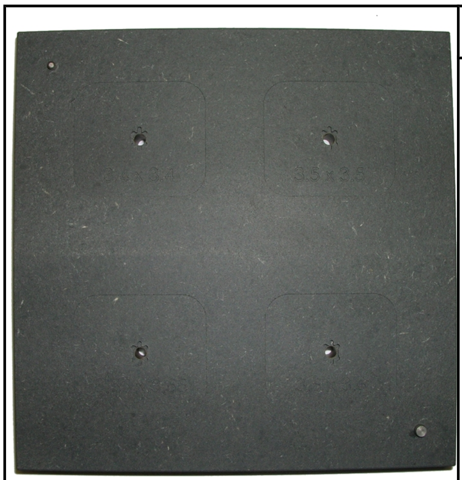
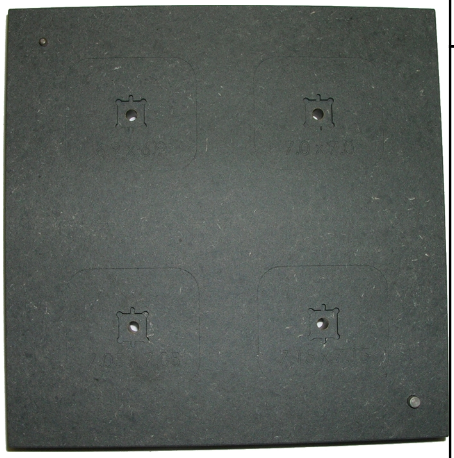
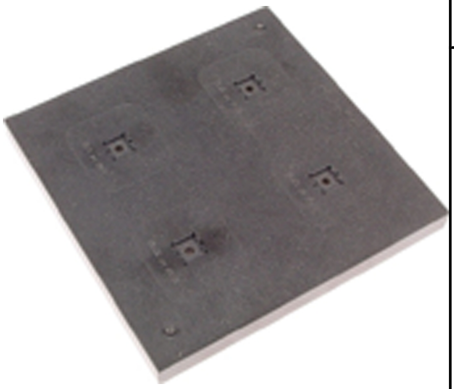


Note: Phoenix enables CU-4 regulators via USB when it is started.

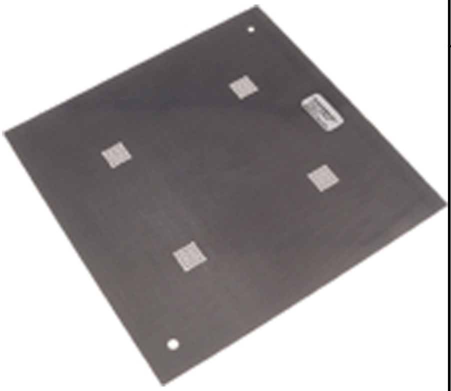
Reconnecting the power supply requires a Phoenix restart.

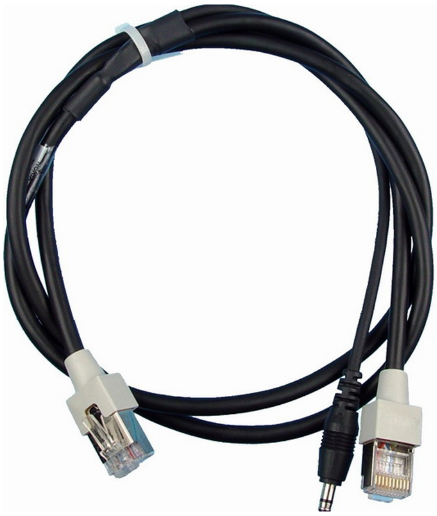
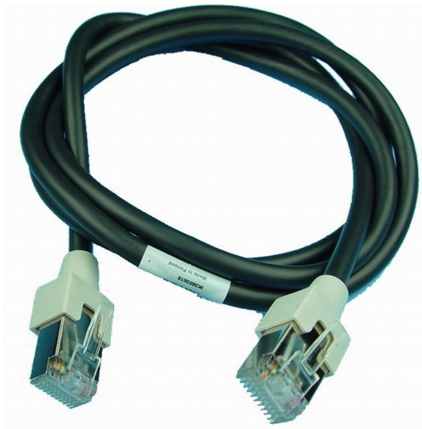
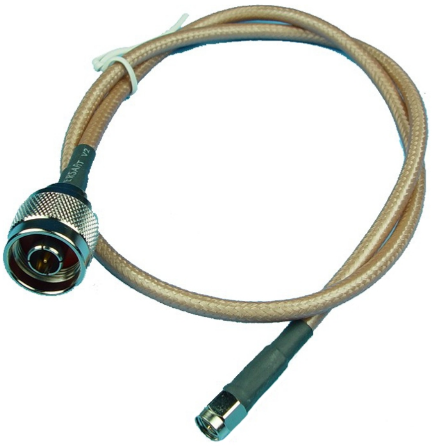
<table>
<tr><td rowspan="2"> </td><td>DKE-2</td><td>Mini-USB cable</td><td></td></tr>
<tr><td colspan="3">USB to mini-USB connector cable.</td></tr>
<tr><td rowspan="2"> </td><td>FLS-4S</td><td>Flash device</td><td></td></tr>
<tr><td colspan="3">FLS-4S is a dongle and flash device incorporated into one package, developed specifically for POS use.</td></tr>
<tr><td rowspan="2"> </td><td>FPS-10</td><td>Flash prommer</td><td></td></tr>
<tr><td colspan="3">FPS-10 interfaces with:
• PC
• Control unit
• Flash adapter
• Smart card
FPS-10 flash prommer features:
• Flash functionality for BB5 and DCT-4 terminals
• Smart Card reader for SX-2 or SX-4
• USB traffic forwarding
• USB to FBUS/Flashbus conversion
• LAN to FBUS/Flashbus and USB conversion
• Vusb output switchable by PC command
FPS-10 sales package includes:
• FPS-10 prommer
• Power Supply with 5 country specific cords
• USB cable</td></tr>
</table>

<table>
<tr><td rowspan="2"> </td><td>JBT-9</td><td>Bluetooth test and interface box (sales package)</td><td></td></tr>
<tr><td colspan="3">The JBT-9 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .
Sales package includes:
• JBT-9 test box
• Installation and warranty information</td></tr>
<tr><td rowspan="2"> </td><td>PCS-1</td><td>Power cable</td><td></td></tr>
<tr><td colspan="3">The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled operating voltage.</td></tr>
<tr><td rowspan="2"> </td><td>PKD-1</td><td>SW security device</td><td></td></tr>
<tr><td colspan="3">SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC.
Without the device, it is not possible to use the service software.
Printer or any such device can be connected to the PC through the device if needed.</td></tr>
<tr><td rowspan="2"></td><td></td><td>RF shield box</td><td></td></tr>
<tr><td colspan="3">Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal.
The shield box is not an active device, it contains only passive filtering components for RF attenuation.</td></tr>
</table>

	RJ-105	Rework jig	RJ-105 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-38 stencil.
	RJ-106	Rework jig	RJ-106 is used for soldering and as a rework jig for the engine module. It is used together with ST-39 stencil.
	RJ-56	Rework jig	RJ-56 is a rework jig used with ST-21.
	SB-6	Bluetooth tester	The SB-6 test box is a generic device to perform Bluetooth bit error rate testing and doing cordless FBUS connection via Bluetooth.

	SB-7	WLAN test box	
	WLAN test requires defined position for the device.		
	SPI-1	Soldering paste injector	
NOKIA SPS-1 0770381 MADE IN FINLAND	SPS-1	Soldering Paste Spreader	
	SRT-6	Opening tool	
	SRT-6 is used to open phone covers and B-to-B connectors.		
NOKIA REMOVE INSERT	SS-15	Camera removal tool	
	The camera removal tool SS-15 is used to remove/attach the camera module from/to the camera socket of the phone PWB.		

	SS-46	Interface adapter	
	SS-46 acts as an interface adapter between the flash adapter and FPS-10.		
	ST-21	Rework stencil	
	ST-21 is a rework stencil used with rework jig RJ-56.		
	ST-38	Rework stencil	
	ST-38 is a rework stencil used with rework jig RJ-105.		
	ST-39	Rework stencil	
	ST-39 is a rework stencil used with rework jig RJ-106.		

<table>
<tr><td rowspan="2">
</td><td>SX-4</td><td>Smart card</td><td></td></tr>
<tr><td colspan="3">SX-4 is a BB5 security device used to protect critical features in tuning and testing.
SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.</td></tr>
<tr><td rowspan="2"></td><td>XCS-1</td><td>Service cable</td><td></td></tr>
<tr><td colspan="3">The XCS-1 service cable is used to connect FLS-4S to the POS flash adapter for supplying a controlled operating voltage and data connection.</td></tr>
<tr><td rowspan="2"></td><td>XCS-4</td><td>Modular cable</td><td></td></tr>
<tr><td colspan="3">XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.</td></tr>
<tr><td rowspan="2"></td><td>XRS-6</td><td>RF cable</td><td></td></tr>
<tr><td colspan="3">The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment.
SMA to N-Connector approximately 610 mm.
Attenuation for:
• GSM850/900: 0.3+-0.1 dB
• GSM1800/1900: 0.5+-0.1 dB
• WLAN: 0.6+-0.1dB</td></tr>
</table>

Service concepts

Flash concept with FPS-10 and LAN

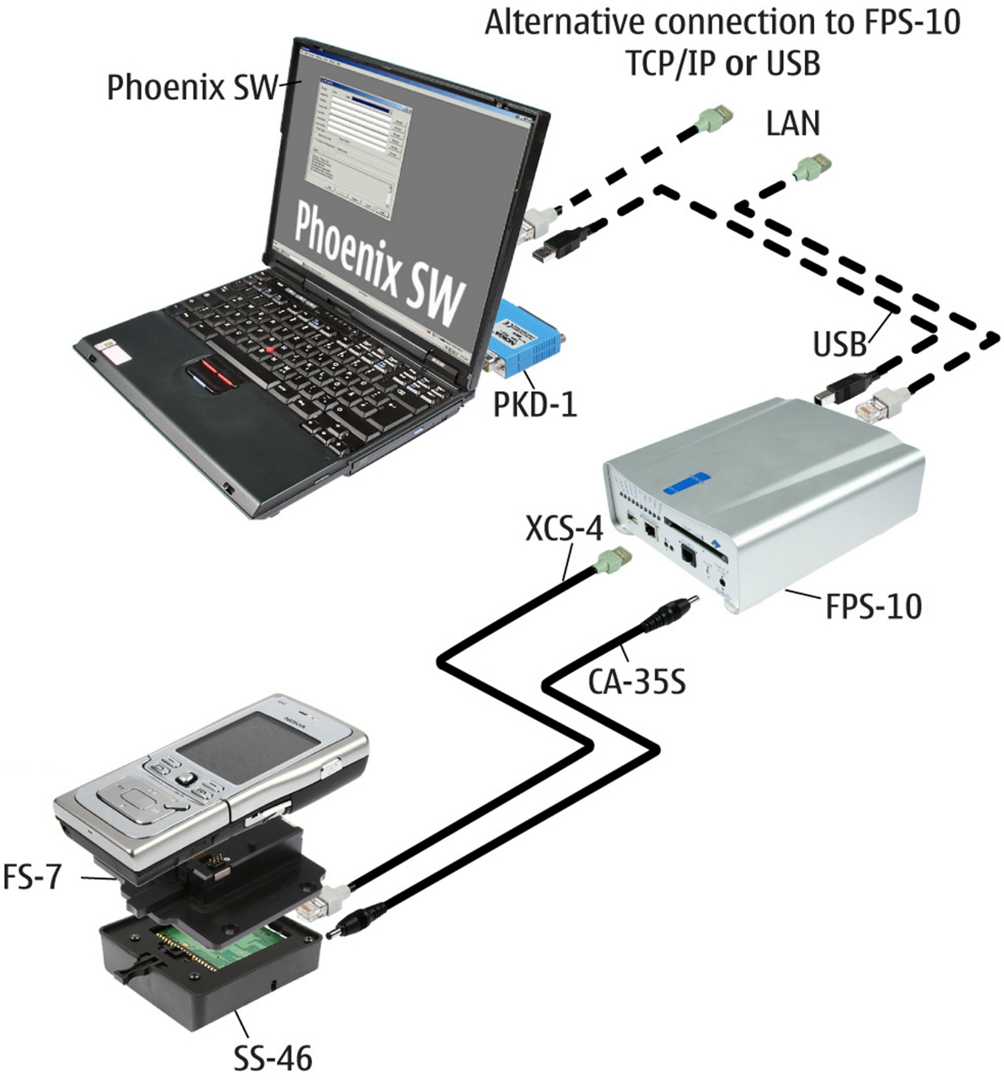

Alternative connection to FPS-10
TCP/IP or USB
Phoenix SW
Phoenix SW
LAN
USB
PKD-1
XCS-4
FPS-10
CA-35S
FS-7
SS-46

Figure 29 Basic flash concept with FPS-10

Note: FPS-8 concept can also be used for flashing.

Item	Type	Description
1	FS-7	Flash adapter
2	SS-46	Interface adapter
3	CA-35S	Power cable
4	XCS-4	Modular cable
5	FPS-10	Flash prommer box
6		Standard USB cable
7	PKD-1	SW security device

MJ-78 module jig concept

The module jig concept is meant for BB / RF testing + tuning and for flashing purposes.

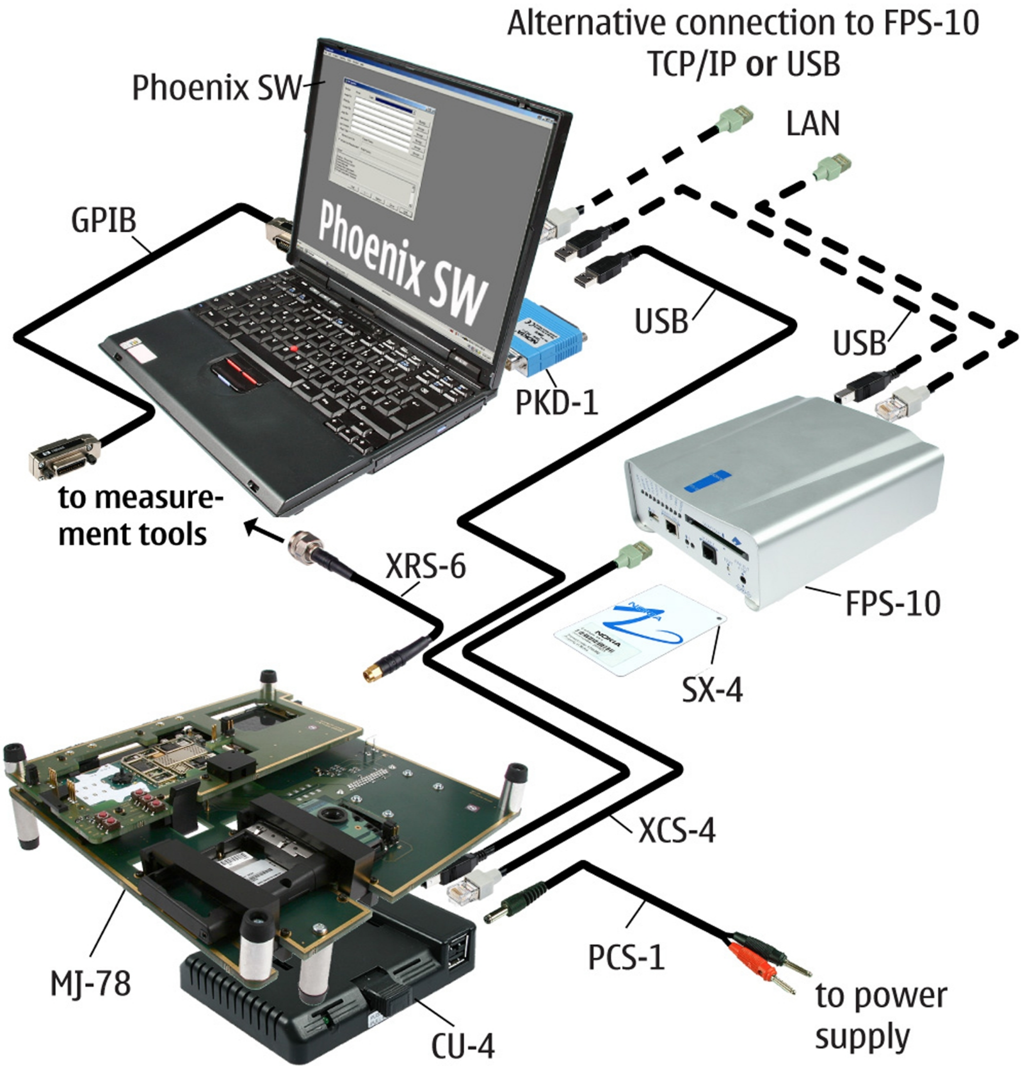

Alternative connection to FPS-10
TCP/IP or USB
Phoenix SW
LAN
GPIB
Phoenix SW
USB
USB
PKD-1
to measure-
ment tools
XRS-6
FPS-10
SX-4
XCS-4
PCS-1
MJ-78
to power
supply
CU-4

Figure 30 MJ-78 module jig service concept

Item	Type	Description
1	MJ-78	Module jig
2	CU-4	Control unit
3	FPS-10	Flash prommer box
4	SX-4	Smart card
5	XCS-4	Modular cable
6	PCS-1	DC power cable
7		Standard USB cable
8		Standard USB cable
9		GPIB control cable
10	XRS-6	RF cable

Item	Type	Description
11	PKD-1	SW security device
12		RF shield box

Note: Item 12 not shown in the picture.

POS (Point of Sale) flash concept

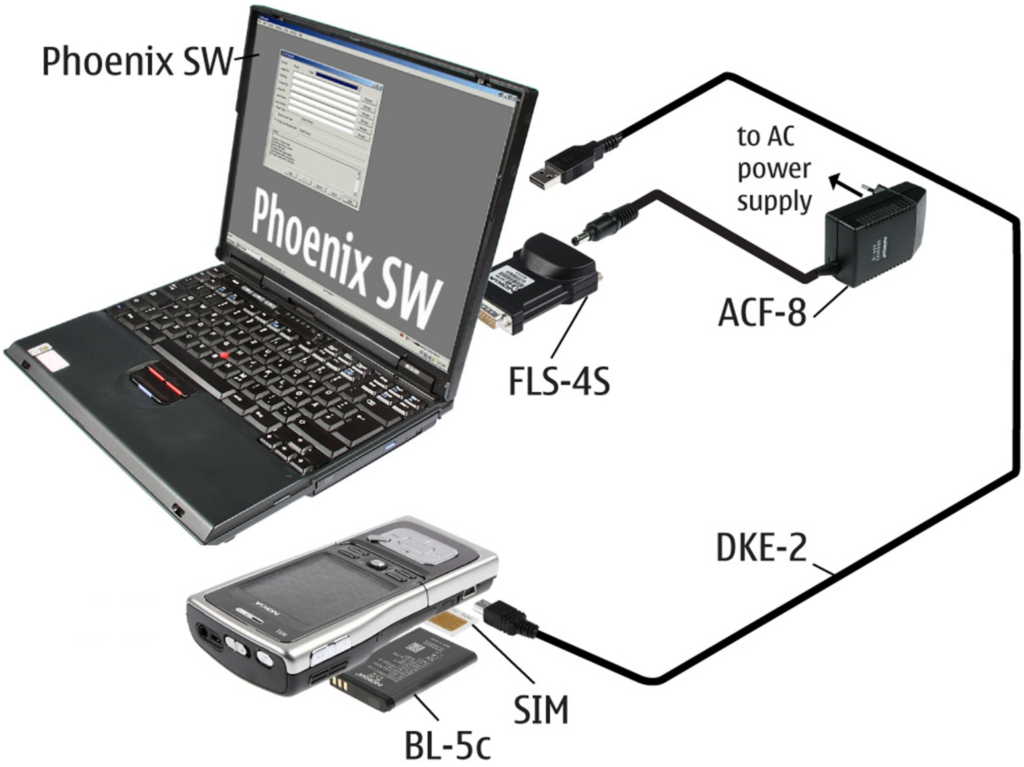

Phoenix SW
Phoenix SW
to AC
power
supply
ACF-8
FLS-4S
DKE-2
SIM
BL-5c

Figure 31 POS flash concept

Item	Type	Description
1	RM-43 with BL-5C	Transceiver with a battery
2	DKE-2	USB connectivity cable
3	FLS-4S	POS flash device
4	ACF-8	Charger

Service concept for RF/BB testing and tuning

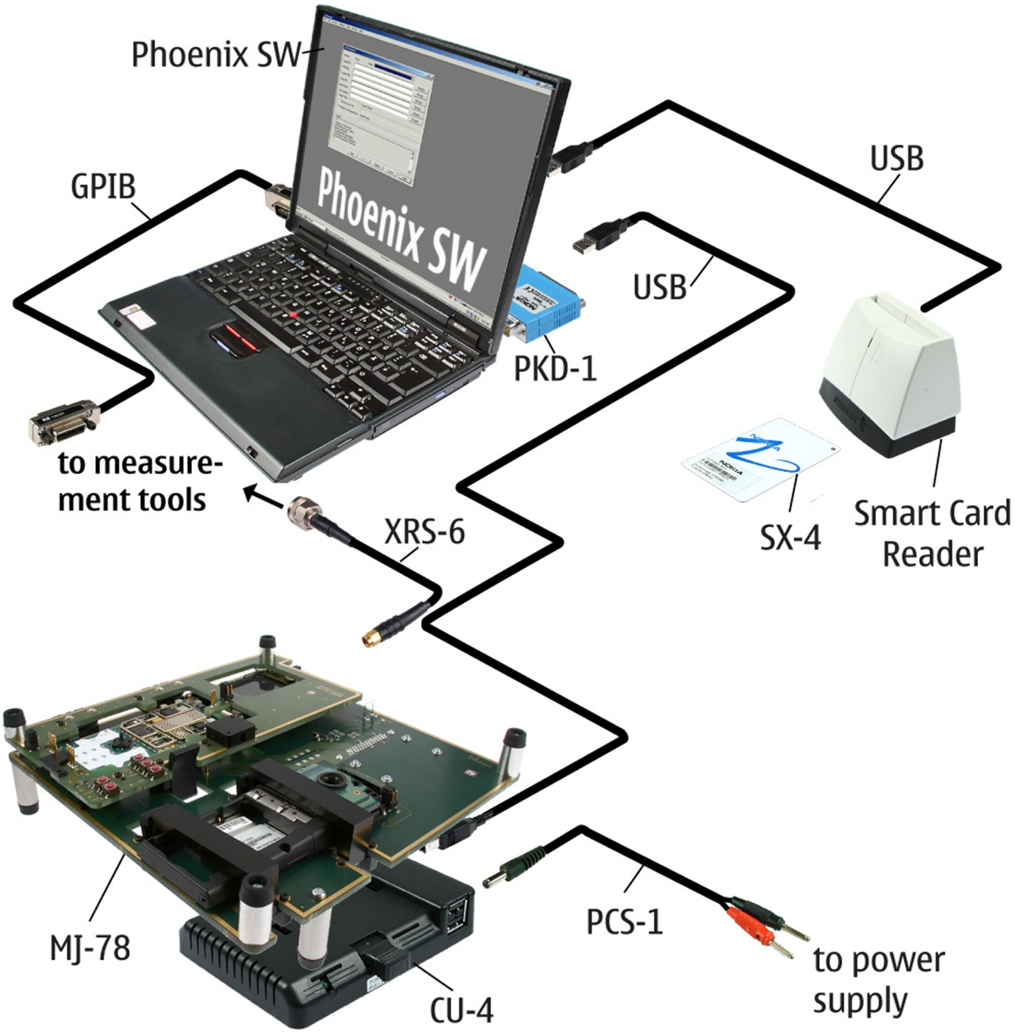

Phoenix SW
GPIB
USB
USB
PKD-1
to measurement tools
XRS-6
SX-4
Smart Card Reader
MJ-78
CU-4
PCS-1
to power supply

Figure 32 Service concept for RF/BB testing and tuning

Item	Type	Description
1	MJ-78	Module jig
2	CU-4	Control unit
3		Standard USB cable
4	PCS-1	DC power cable
5		Standard USB cable + smart card reader
6	SX-4	Smart card
7	XRS-6	RF cable
8		GPIB control cable
9	PKD-1	SW security device
10		RF shield box

Note: Item 10 not shown in the picture.

CU-4 flash concept with FPS-10

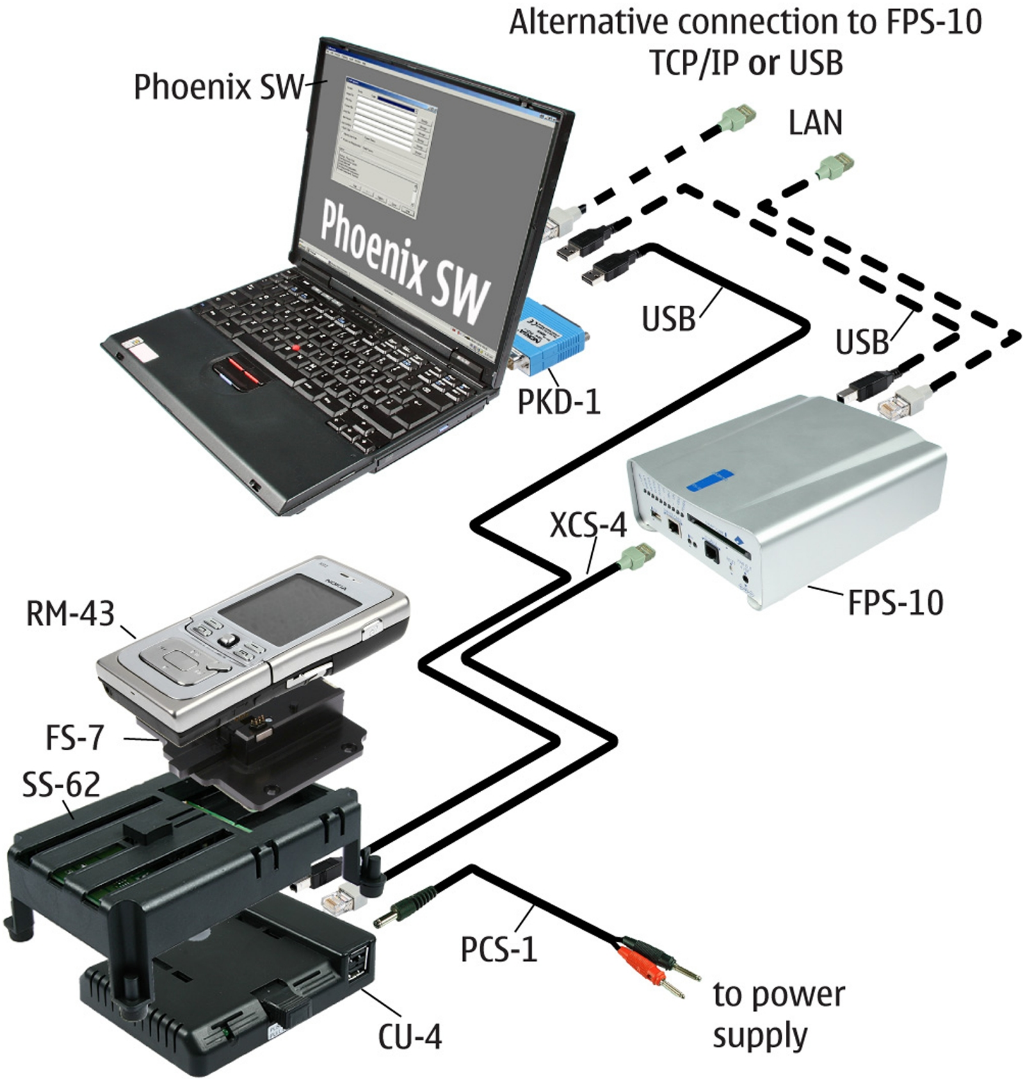

Alternative connection to FPS-10
TCP/IP or USB
Phoenix SW
Phoenix SW
LAN
USB
USB
PKD-1
XCS-4
FPS-10
RM-43
FS-7
SS-62
PCS-1
to power supply
CU-4

Figure 33 CU-4 flash concept with FPS-10

Note: FPS-8 concept can also be used for flashing.

Item	Type	Description
1	FS-7 + SS-62	Flash adapter + generic flash adapter base for BB5 products
2	CU-4	Control unit
3	XCS-4	Modular cable
4	PCS-1	Power cable
5	FPS-10	Flash prommer box
6		Standard USB cable
7		Standard USB cable

Item	Type	Description
8	PKD-1	SW security device

RF testing and BB testing/tuning

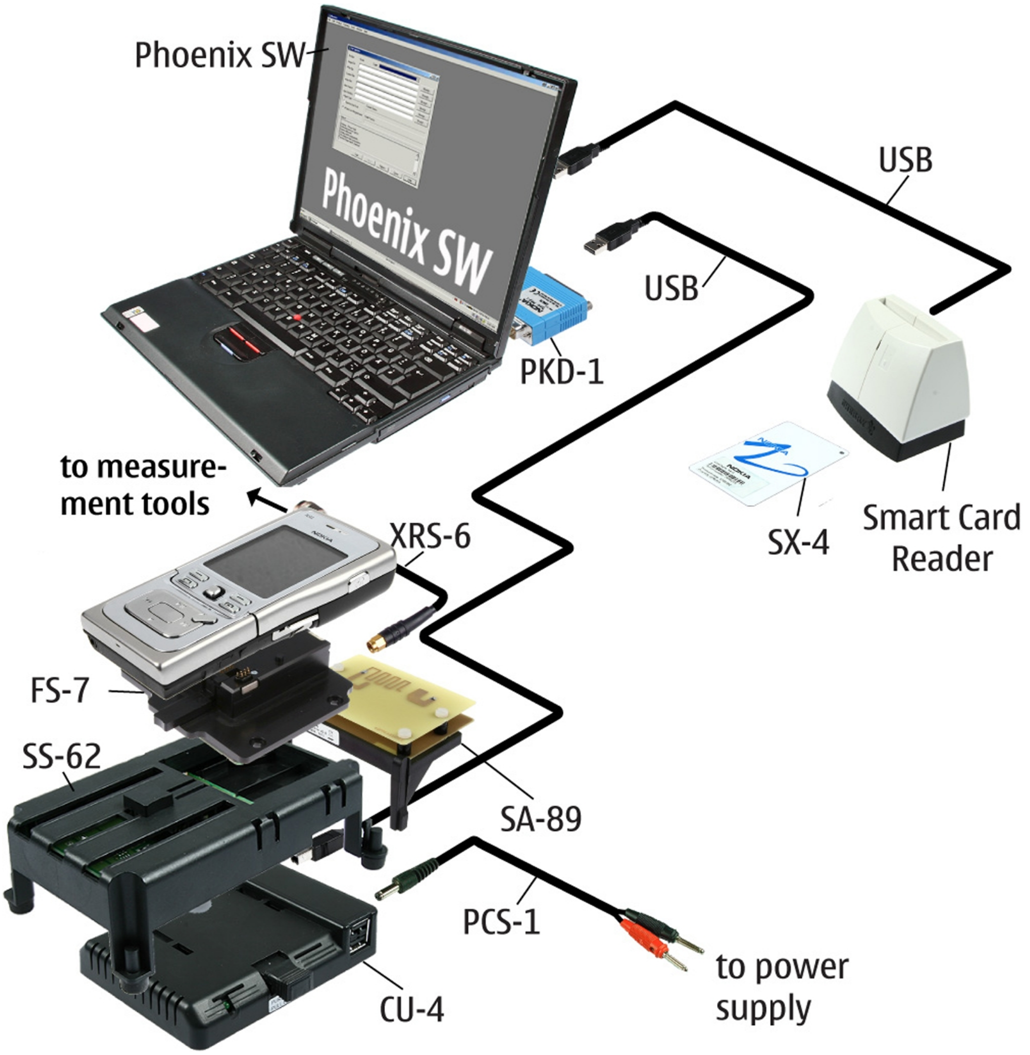

Phoenix SW
Phoenix SW
USB
USB
PKD-1
Smart Card Reader
SX-4
to measurement tools
XRS-6
FS-7
SS-62
SA-89
PCS-1
to power supply
CU-4

Figure 34 RF testing and BB testing/tuning

Item	Type	Description
1	FS-7 + SS-62	Flash adapter + generic flash adapter base for BB5 products
2	CU-4	Control unit
3	SA-89	RF coupler
4	PCS-1	Power cable
5		Standard USB cable
6		Standard USB cable + smart card reader
7	SX-4	Smart card

Item	Type	Description
8		GPIB control cable
9	XRS-6	RF cable
10	PKD-1	SW security device
11		RF shield box

Note: Item 11 not shown in the picture.

5 — Disassembly/Reassembly Instructions

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Table of Contents

Disassembly instructions..5–5
Reassembly instructions..5–17

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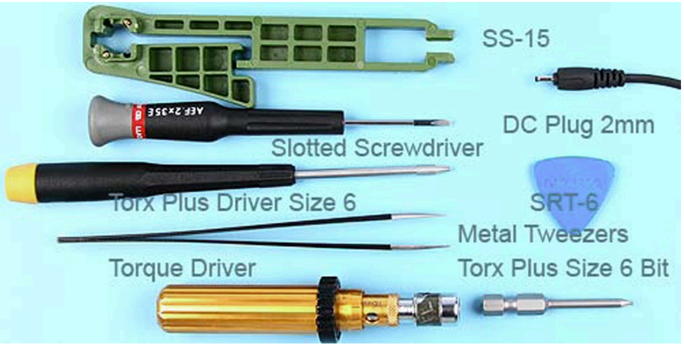
Disassembly instructions

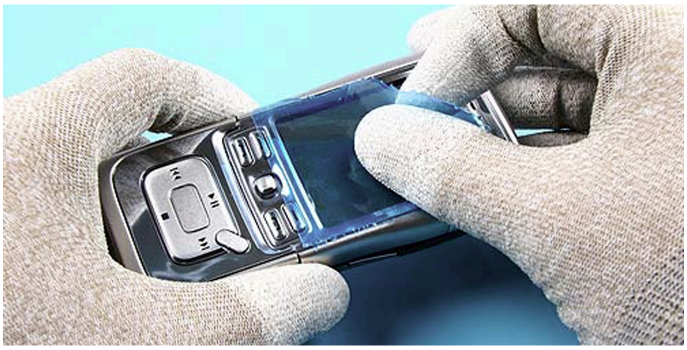
Before you begin

Required tools:

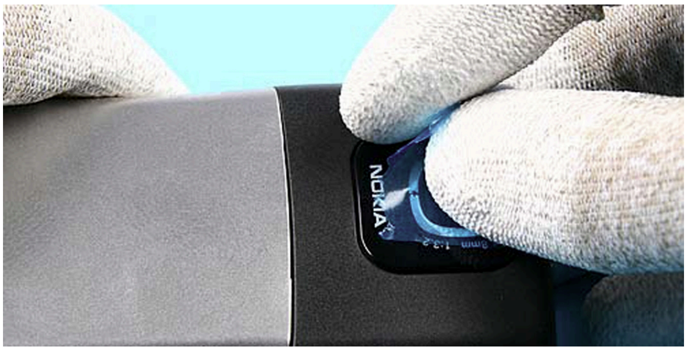

SS-15
DC Plug 2mm
Slotted Screwdriver
Torx Plus Driver Size 6
SRT-6
Metal Tweezers
Torque Driver
Torx Plus Size 6 Bit

Steps

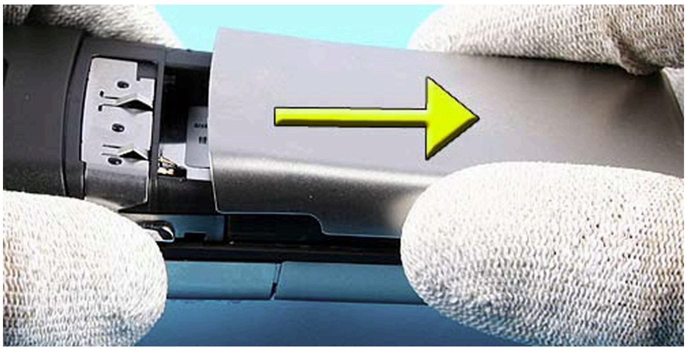
1. Protect the window with a plastic film.



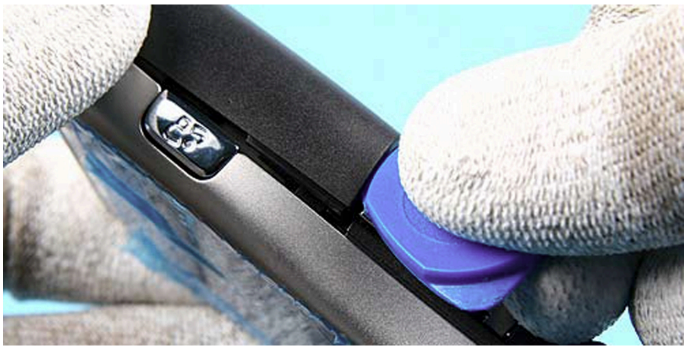
2. Protect the camera window with a plastic film.



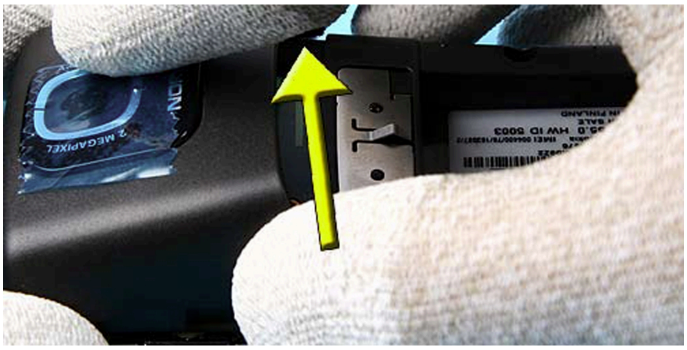
3. Unlock and remove the B-Cover.



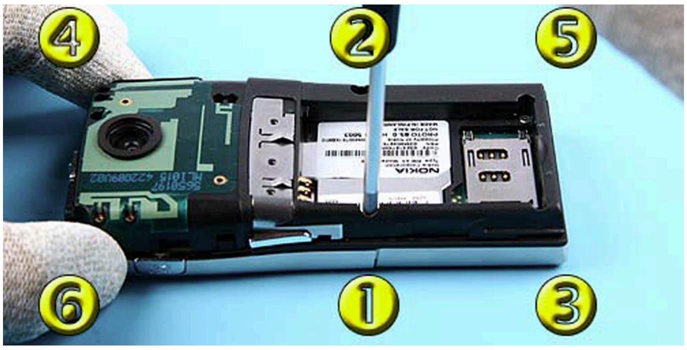
4. Carefully release the clips of the antenna cover on both sides.



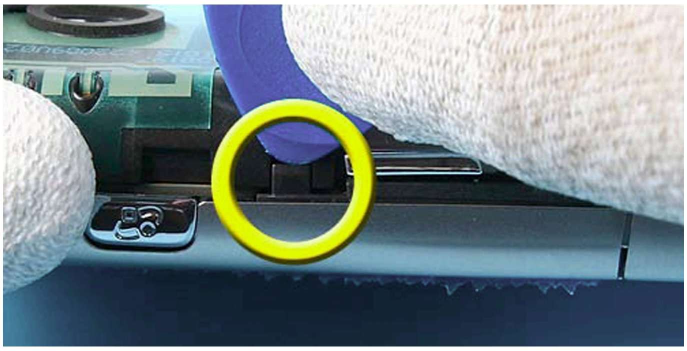
5. Remove the antenna cover.



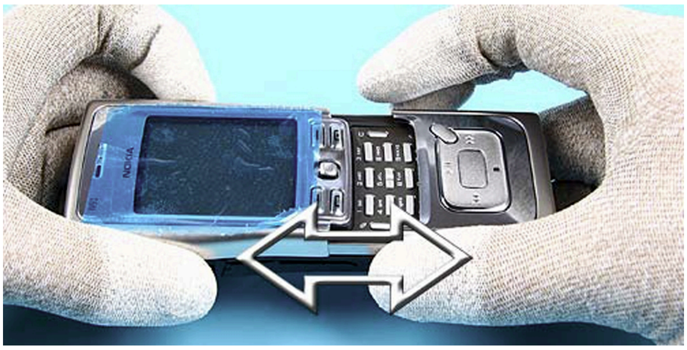
6. Remove the six screws in the order shown.



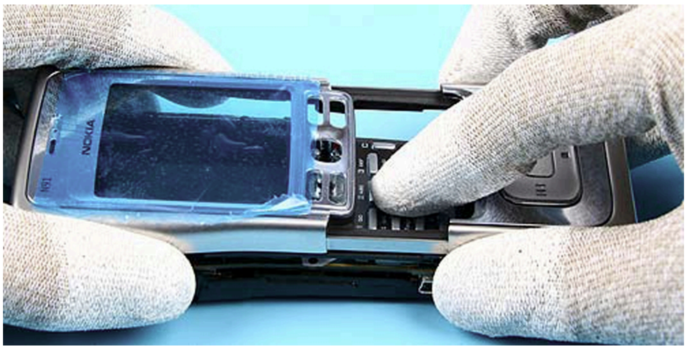
7. Carefully unlock the clips on both sides of the assembly.



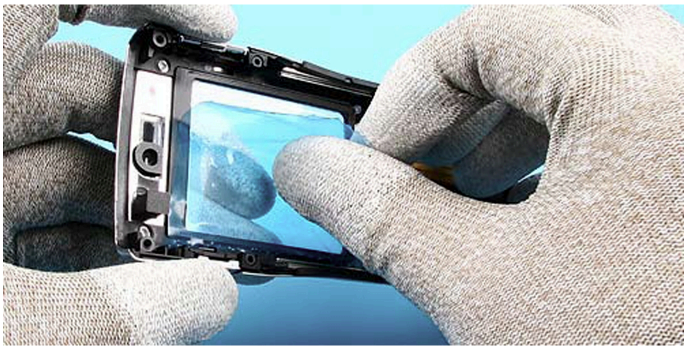
8. Open the assembly.



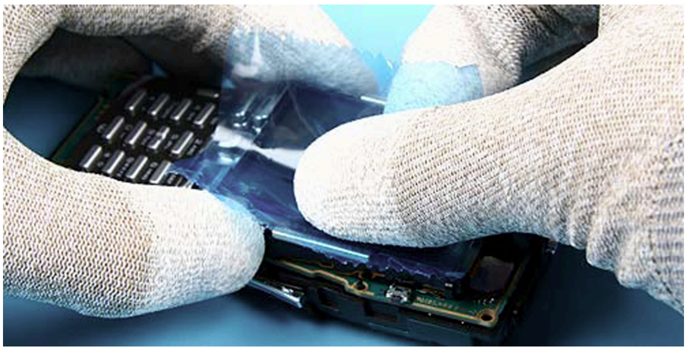
9. Push down the keymat, and at the same time lift up the slide assembly.



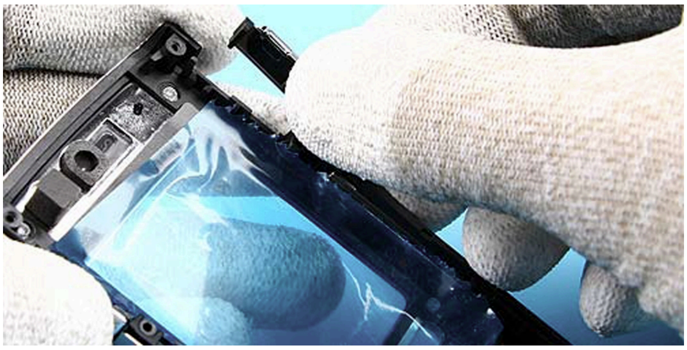
10. Protect the inner side of the window with a plastic film.



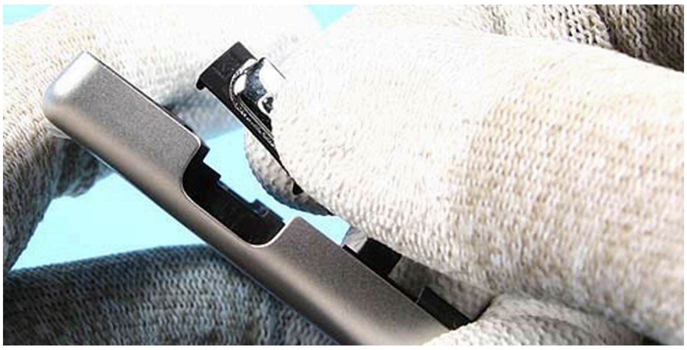
11. Protect the LCD with a plastic film.



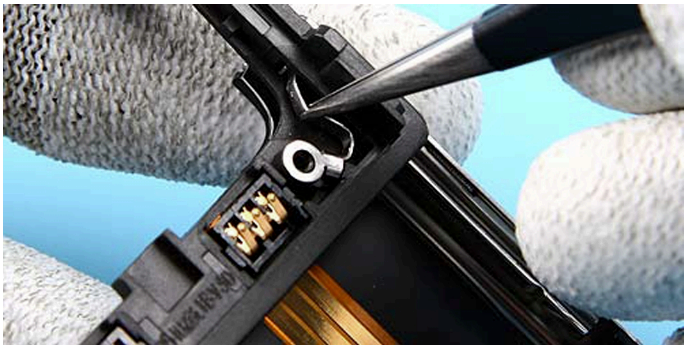
12. Remove the volume key hardtop.



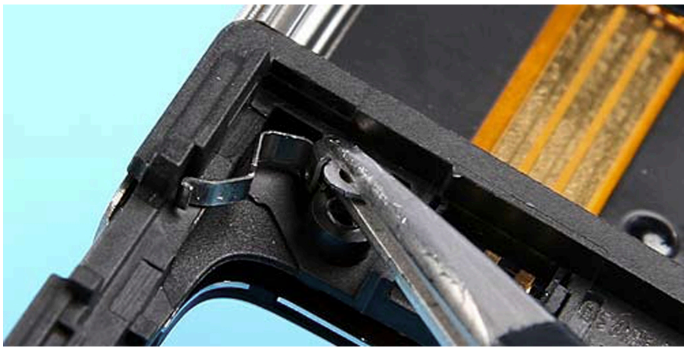
13. Remove the menu key hardtop.



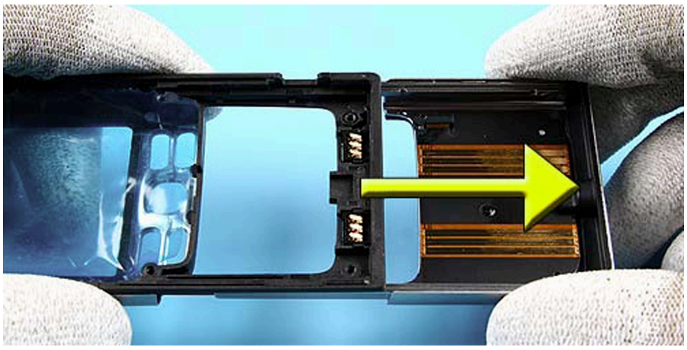
14. Use tweezers to unlock the rail spring L.



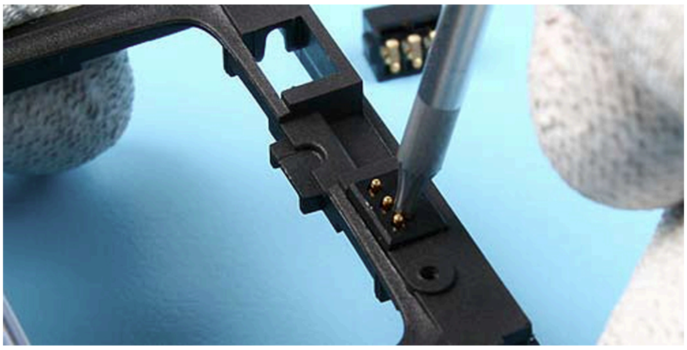
15. Remove the rail spring L.



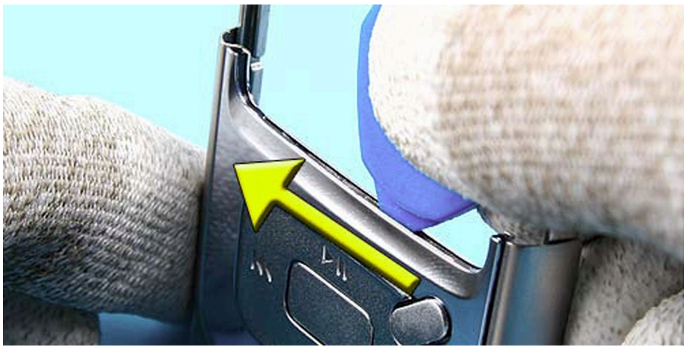
16. Remove the slide assembly.



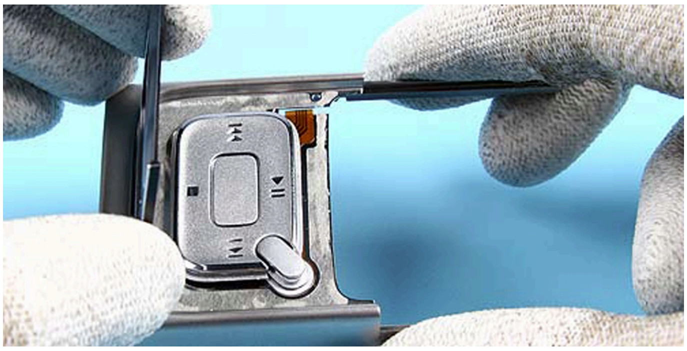
17. Push out both slide connector pogos.



18. Use SRT-6 to carefully release the slide bezel.

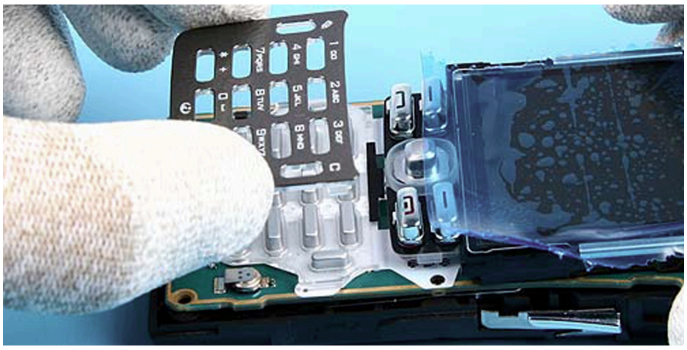


19. Carefully remove the slide bezel.

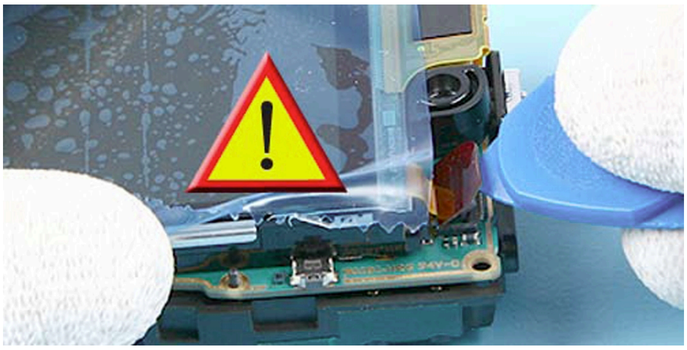


20. Remove adhesive residue.

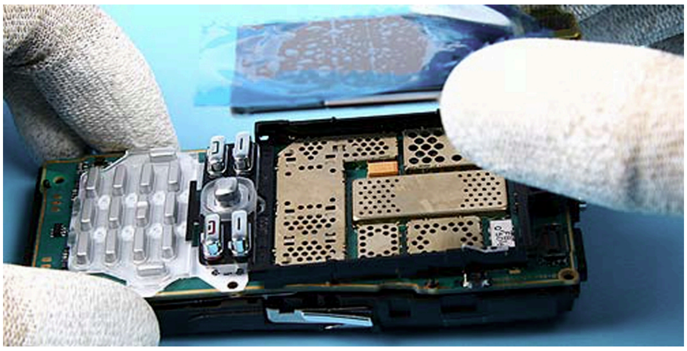
21. Remove the bezel cover.



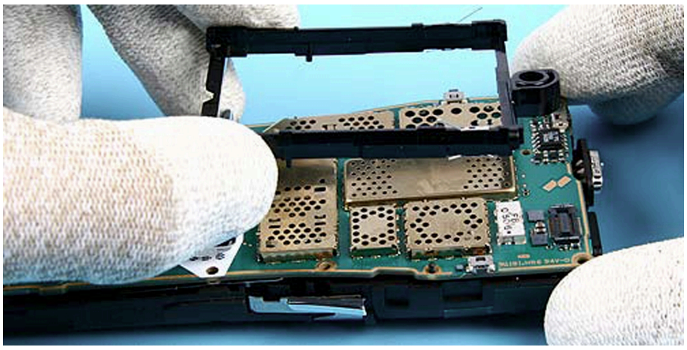
22. Use SRT-6 to open the LCD flex connector.



23. Remove the LCD.

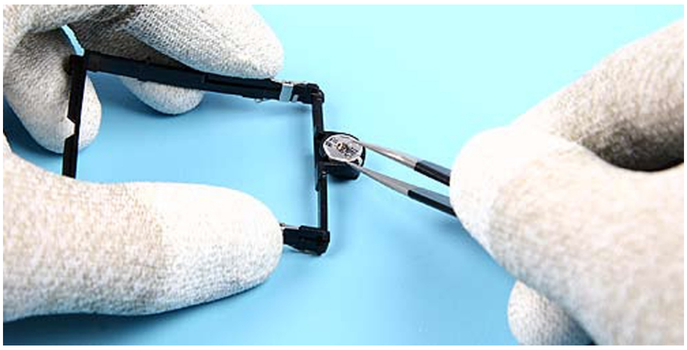


24. Remove the display frame.

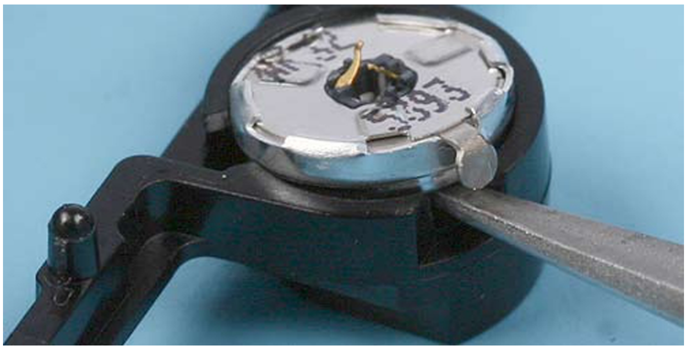


25. Use tweezers to remove the earpiece.

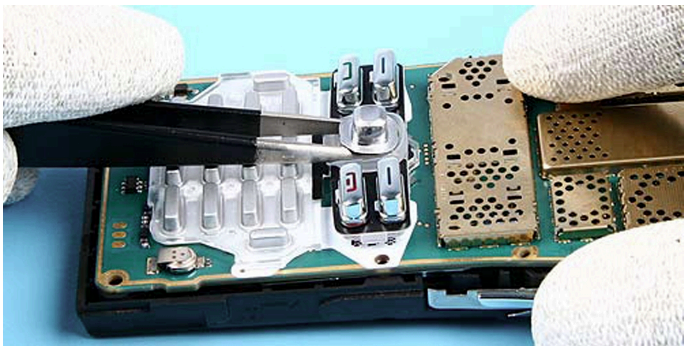
    Note: Be careful not to damage the grounding clips of the display frame when removing the earpiece.



26. Use tweezers to carefully remove the earpiece.



27. Use tweezers to remove the joystick button.



Note: Be careful not to damage the T9 keymat.

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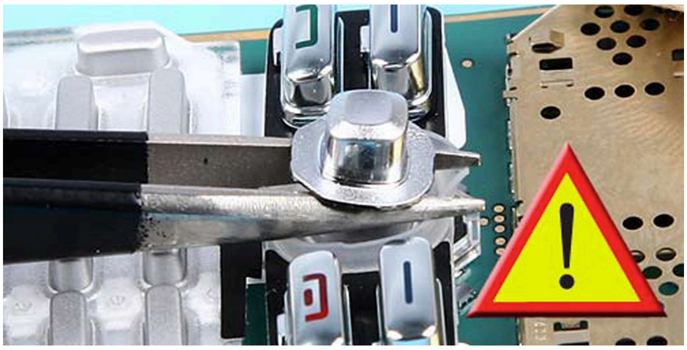
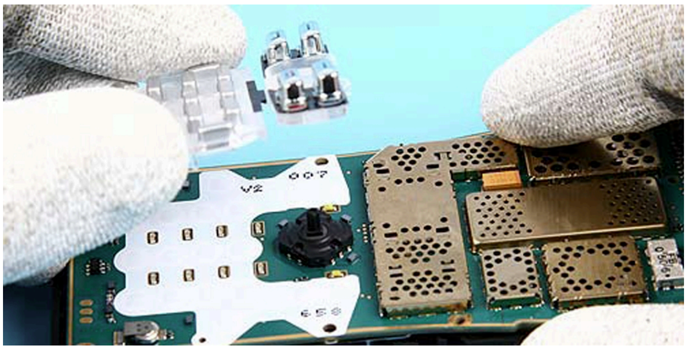
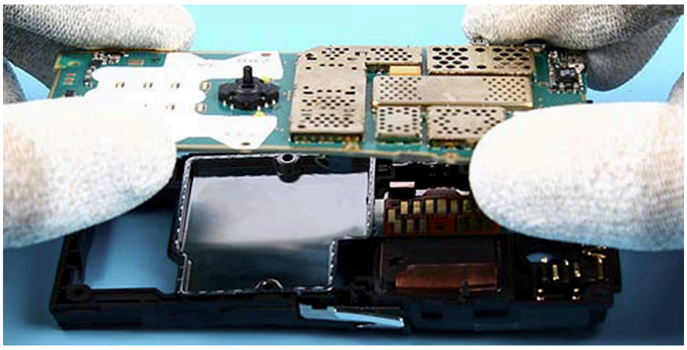


28. Remove the T9 keymat.

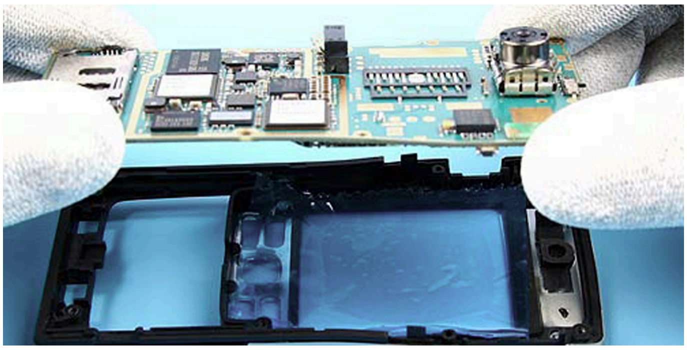


29. Remove the engine module.

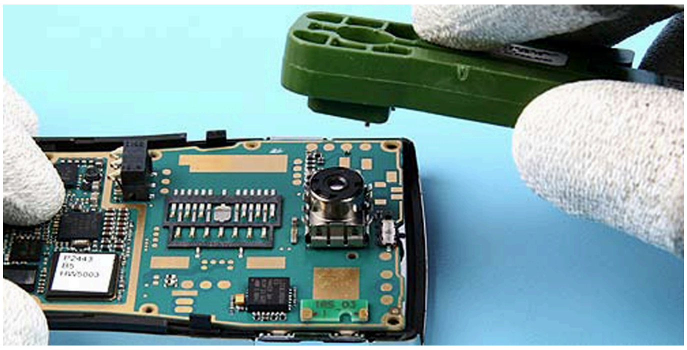


30. Turn the engine module around, and place it on the A-Cover.

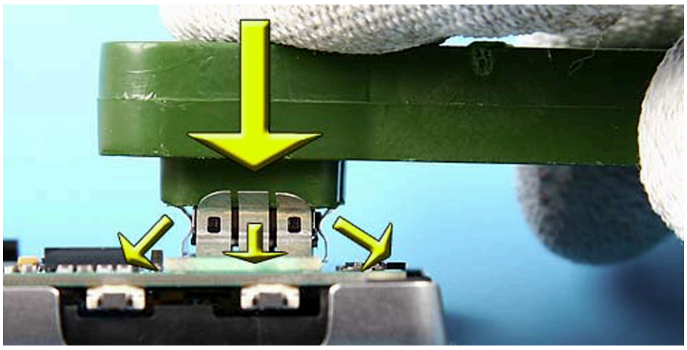
    A-Cover functions as support when removing the camera module.



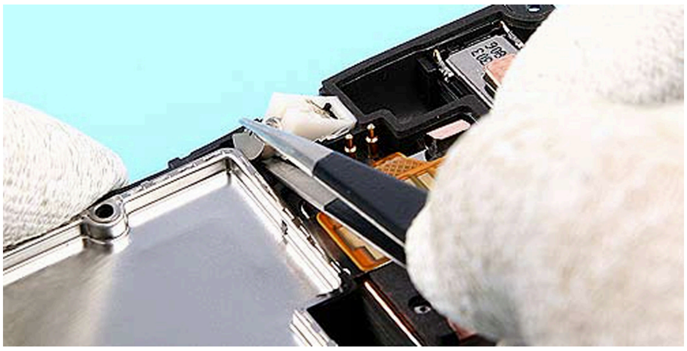
31. Place SS-15 on the camera module and tighten the grip.



32. After you have released the clips, remove the camera module.

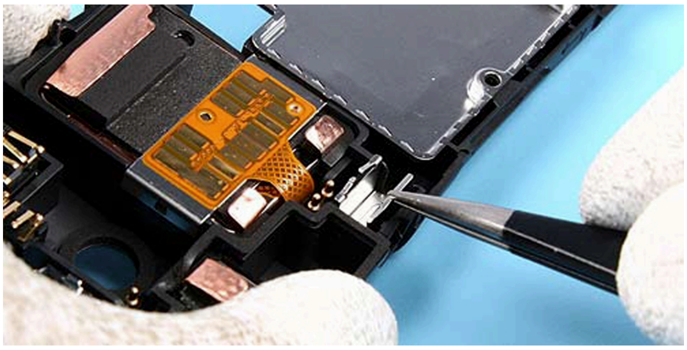


33. Use tweezers to remove the vibra.

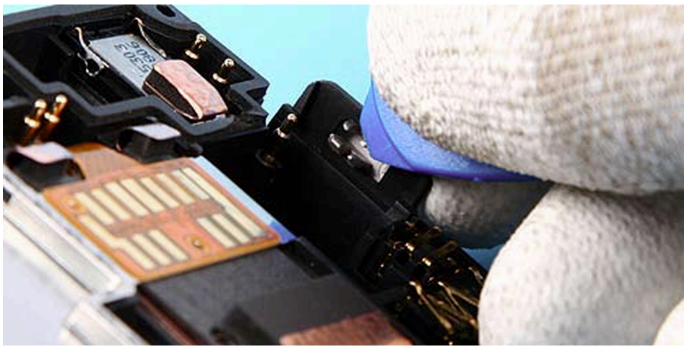


34. Use tweezers to pull out the vibra shield.

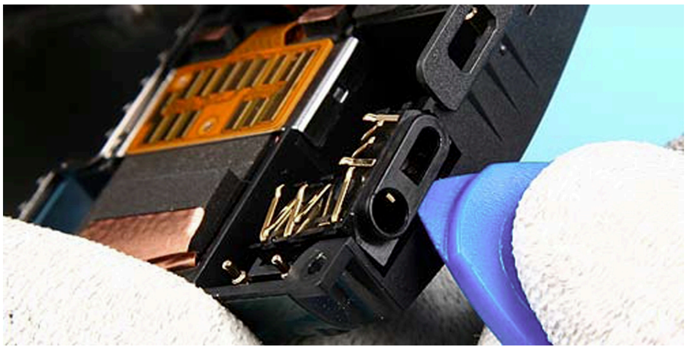
   Note: Be careful not to damage the grounding clips.

- 

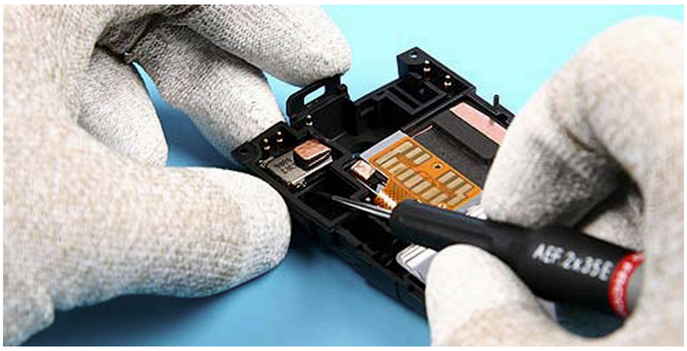
35. Use SRT-6 to remove the hold switch handle.



36. Use SRT-6 to loosen the 3.5 mm audio jack, and remove it.



37. Use the slotted screwdriver to release the IHF speaker.



Note: Be careful not to damage the speaker adhesive.

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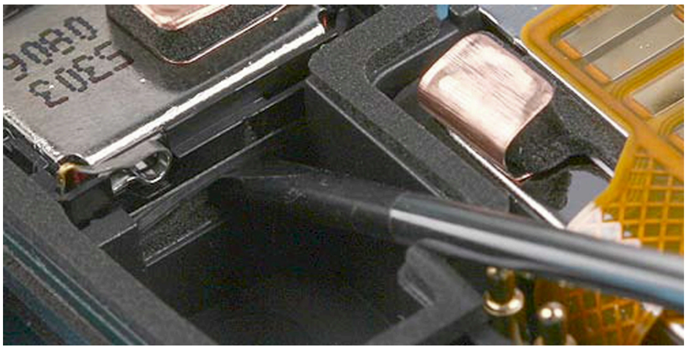
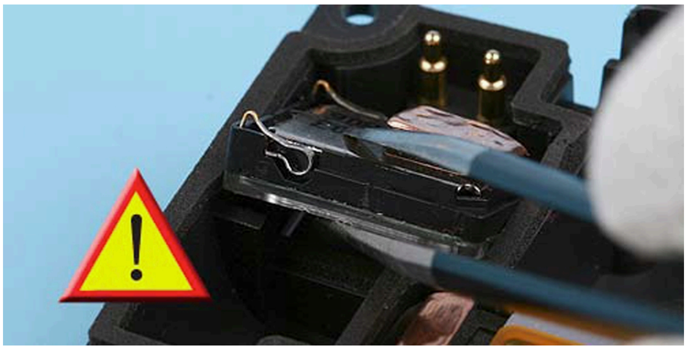
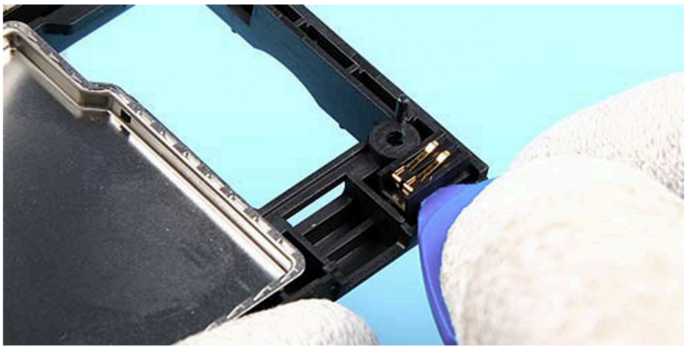


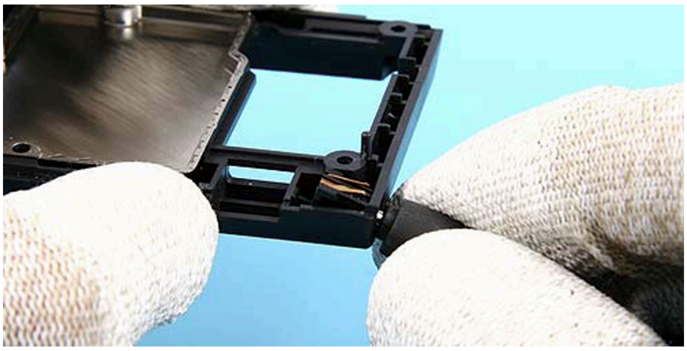
38. Carefully remove the IHF speaker; avoid touching the diaphragm.



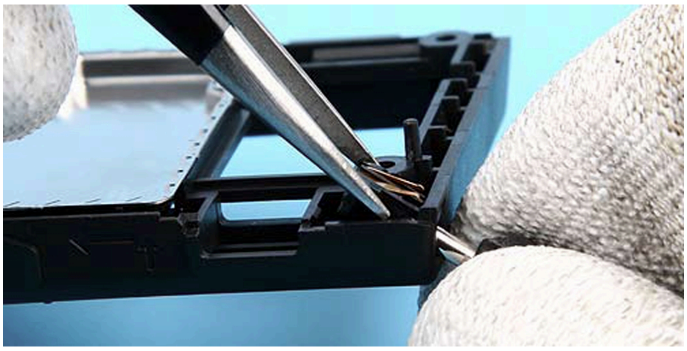
39. Use SRT-6 to carefully unlock the spacer for DC jack; avoid bending the spring contacts.



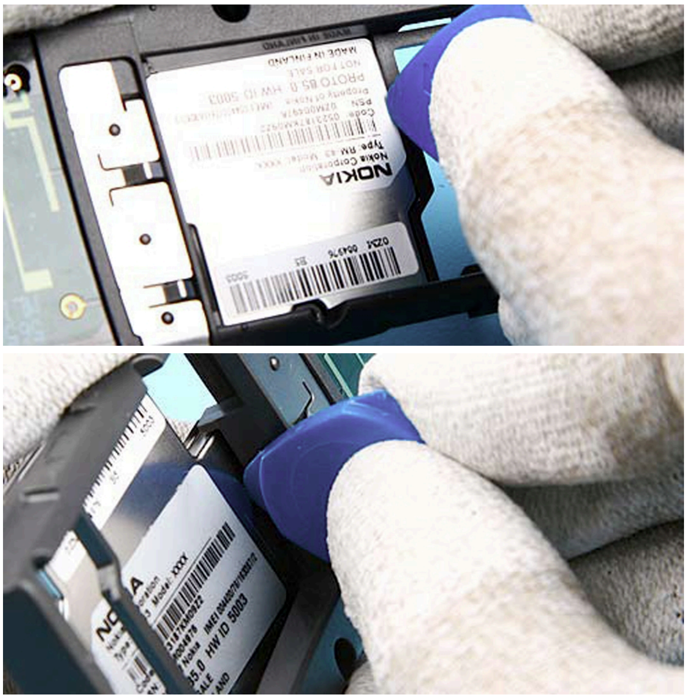
40. Use the DC plug to lever out the DC jack.



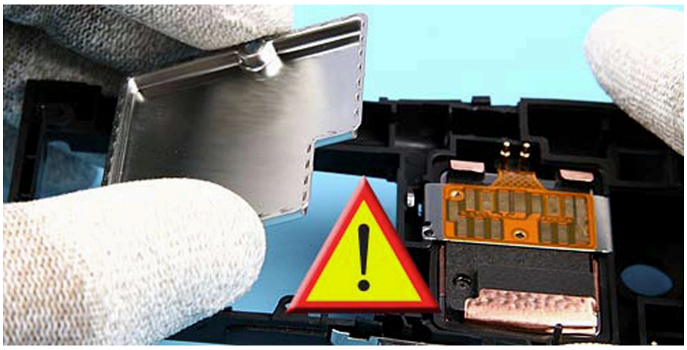
41. Use tweezers to pull out the DC jack.



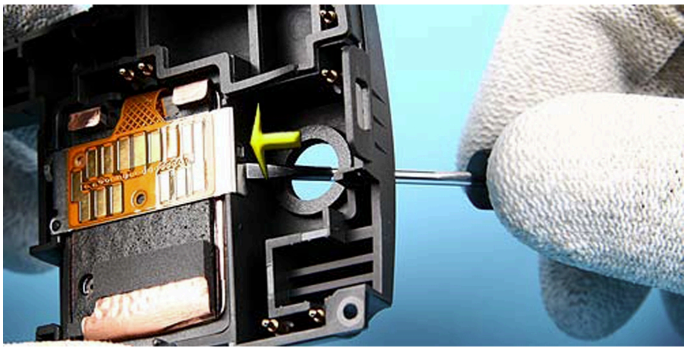
42. Unlock both sides of the BB unishield.



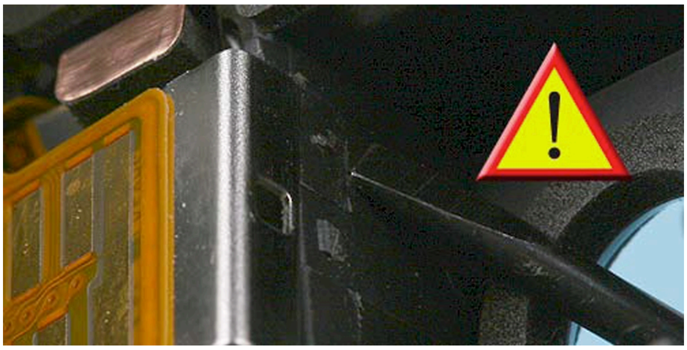
43. Remove the BB unishield; watch out for the sharp grounding clips.



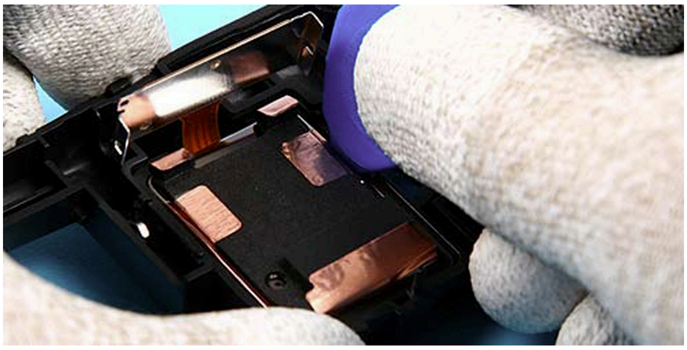
44. Use a slotted screwdriver to unlock the HDD.

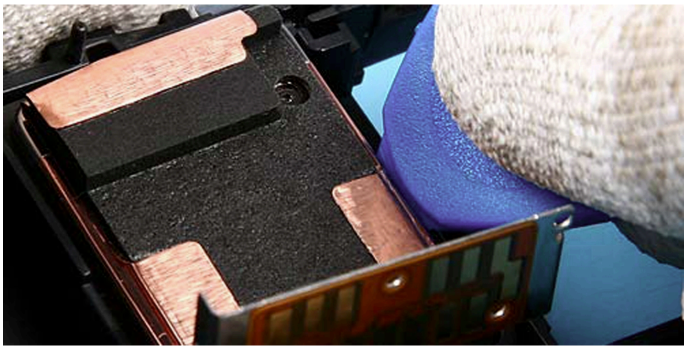


Caution: Be careful not to damage the fixing joint.

- 

45. Lever out the HDD first on the front side, and then continue on the opposite side.

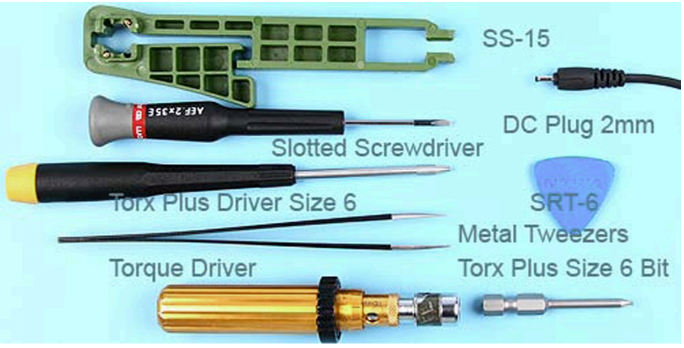




Reassembly instructions

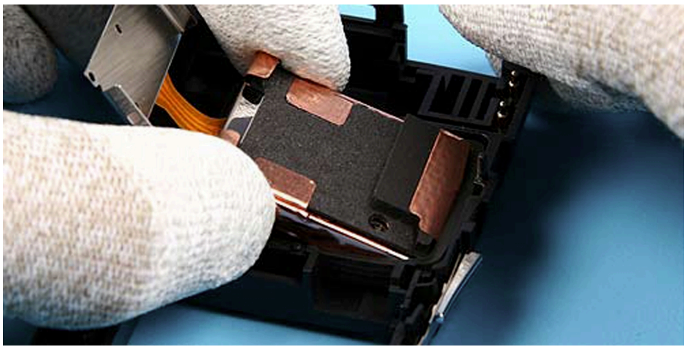
Before you begin

Required tools:

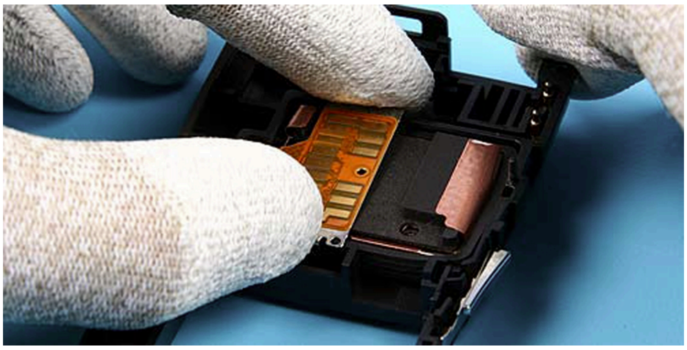

SS-15
DC Plug 2mm
Slotted Screwdriver
Torx Plus Driver Size 6
SRT-6
Metal Tweezers
Torque Driver
Torx Plus Size 6 Bit

Steps

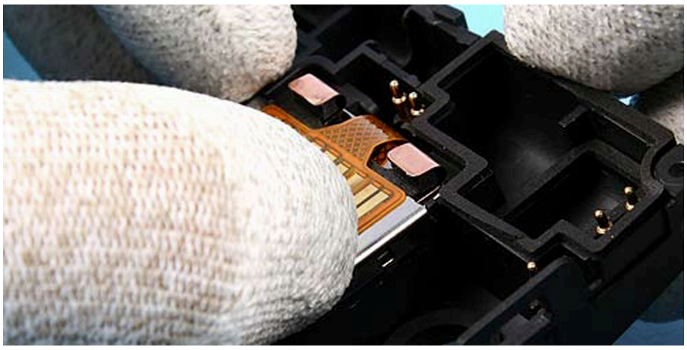
1. Insert the HDD into the HDD gasket.



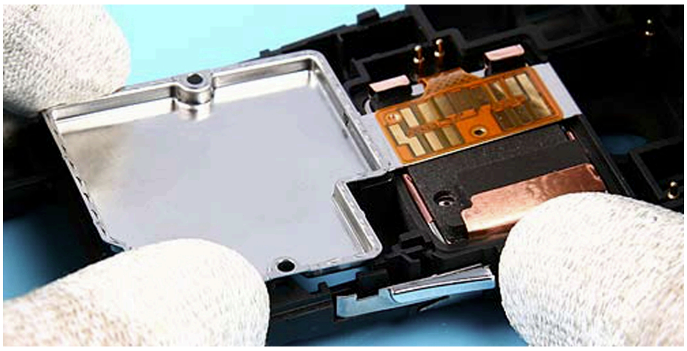
2. Flip down the connector plate of the HDD; do not touch the pads.



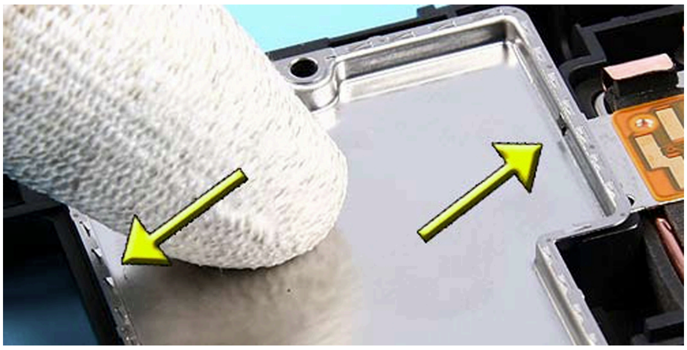
3. attach the connector plate.



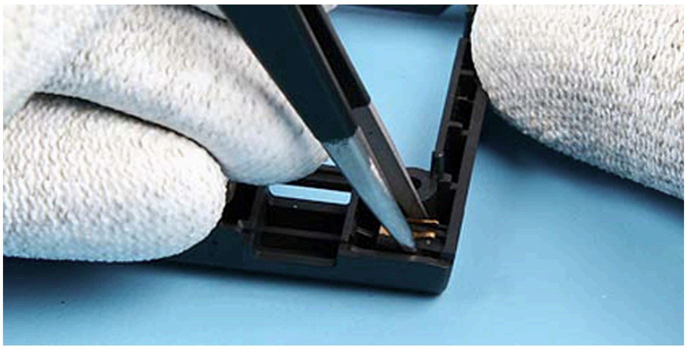
4. Place the BB unishield on the C-cover.



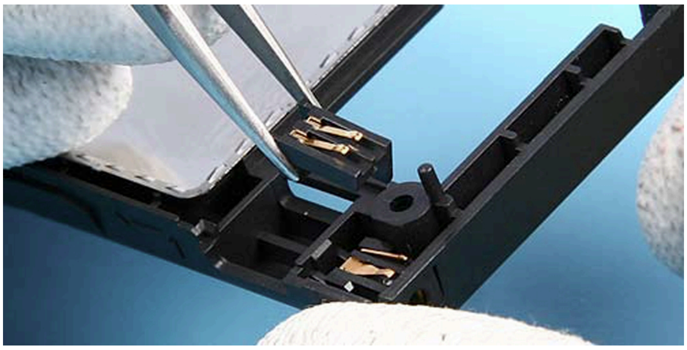
5. Push down the BB unishield to snap the two clips in place.



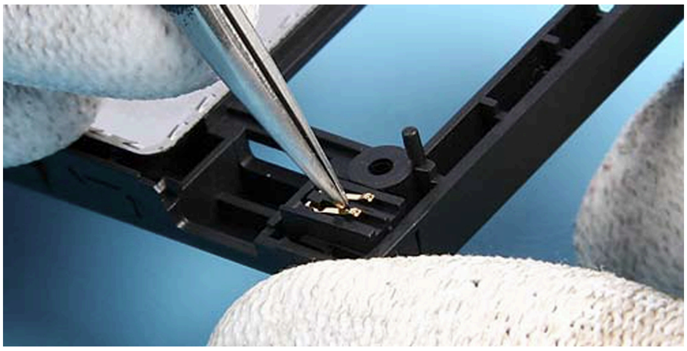
6. Use tweezers to place the DC jack back into its place.



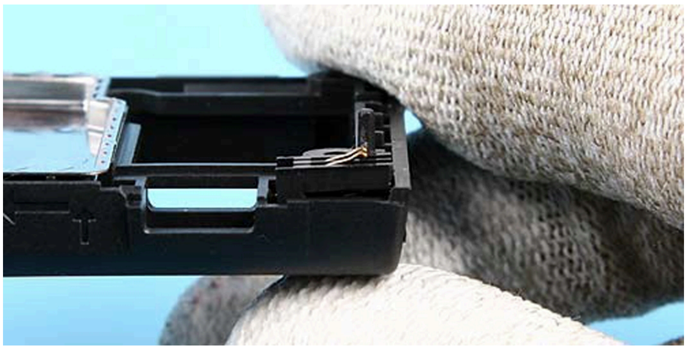
7. Place the DC jack spacer on top of the DC jack.



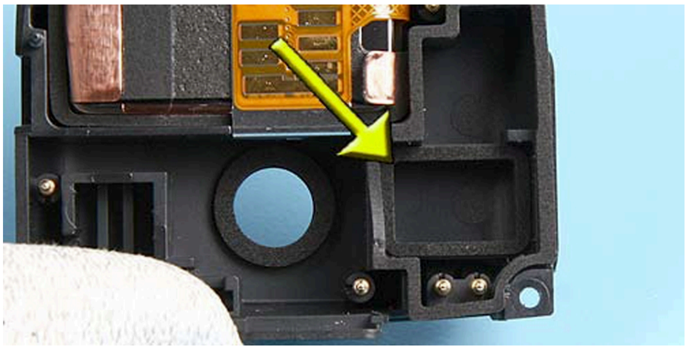
8. Carefully push the DC jack spacer into its place.



9. Check that the DC jack spacer is in correct position.

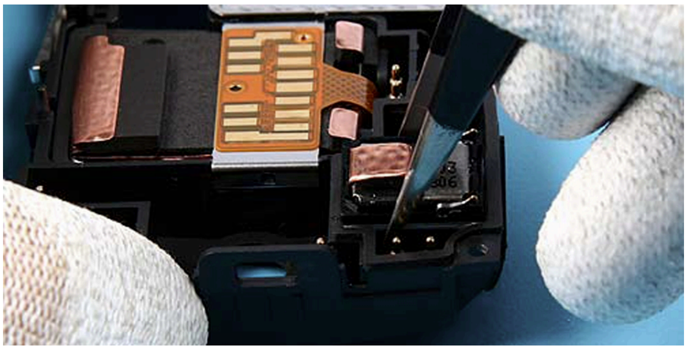


10. Check if the IHF adhesive is in place; replace if missing or not properly attached.



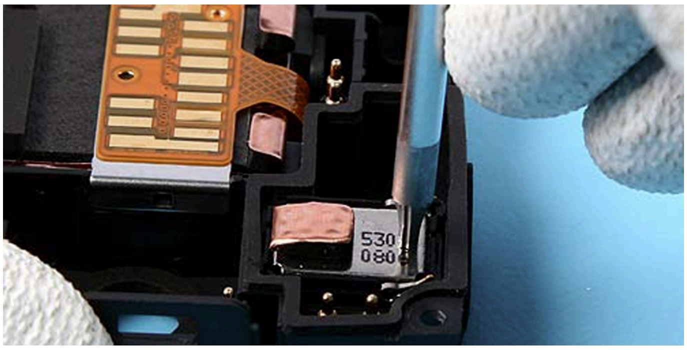
11. Place the IHF speaker to its place.

    Note: Always use a new IHF speaker gasket when replacing the speaker.

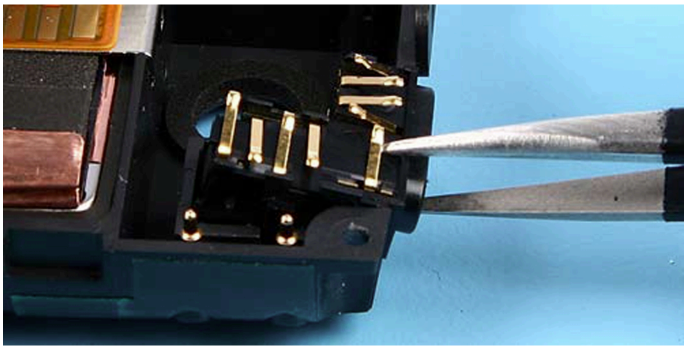


12. Push the IHF speaker gently into its place.

    Note: Avoid damaging the spring contacts.

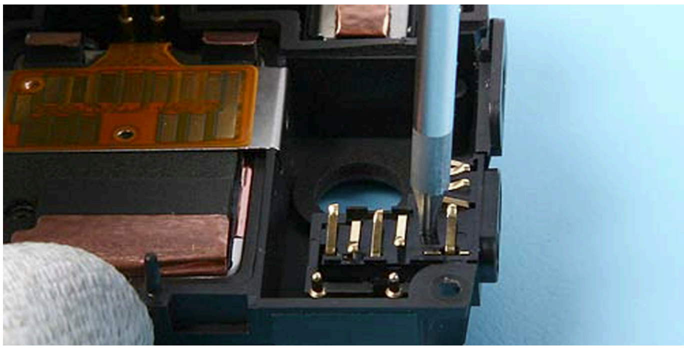


13. Use tweezers to place the 3.5 mm audio jack into its compartment.



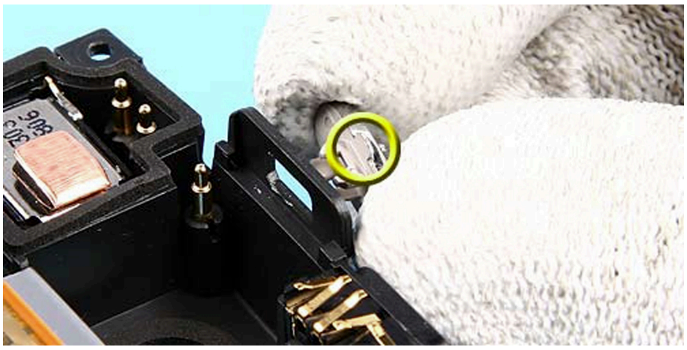
14. Use a slotted screwdriver to gently push down the audio jack.

Note: Avoid damaging the spring contacts when pushing the audio jack into its place.

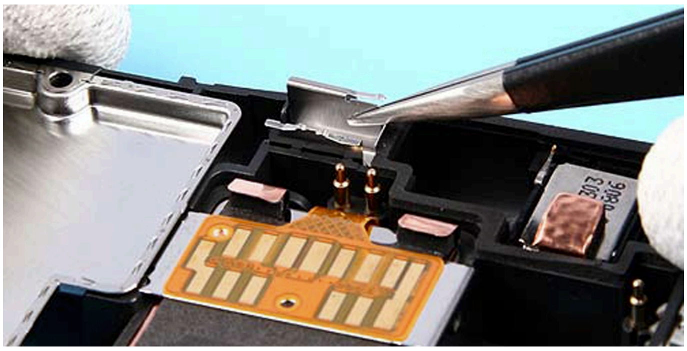


15. Attach the hold switch handle.

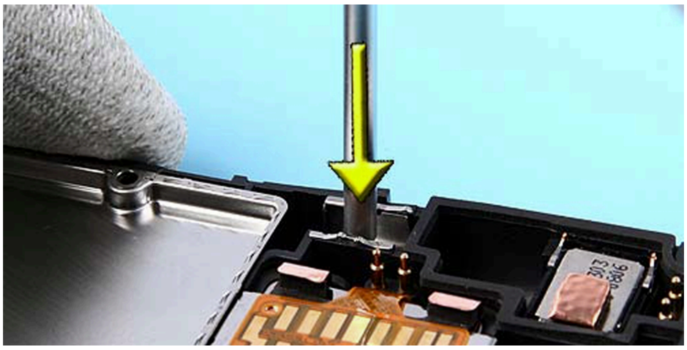
Check the correct position before attaching.



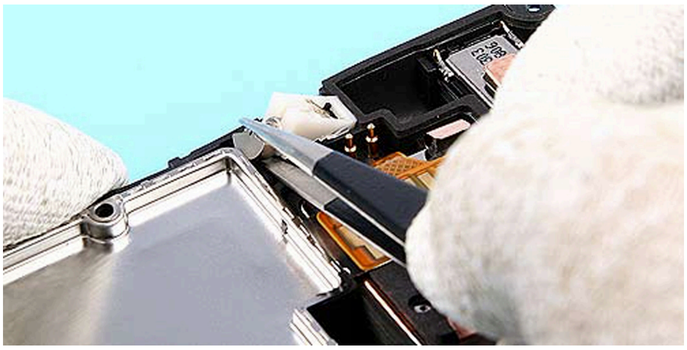
16. Use tweezers to place the vibra shield.



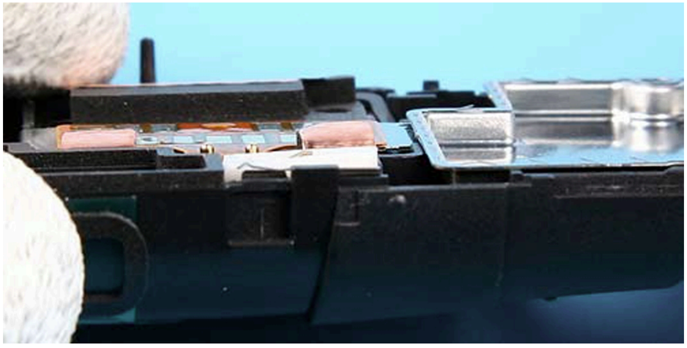
17. Use a slotted screwdriver to push down the vibra shield into its place.



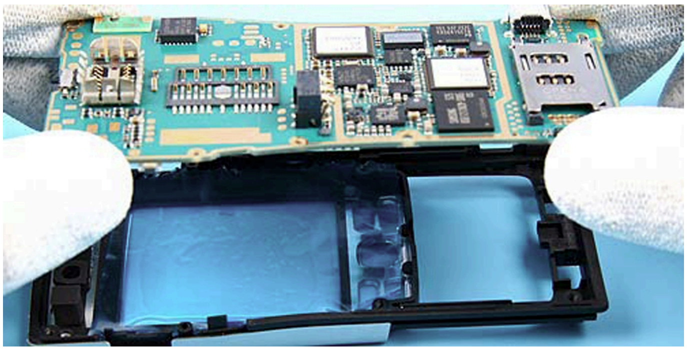
18. Place the vibra into its place.



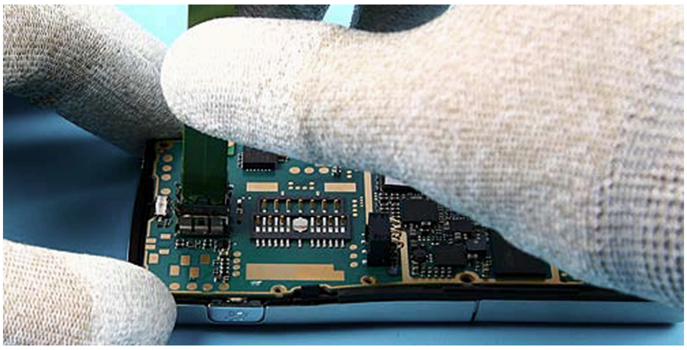
19. Check that the vibra is in the correct position.



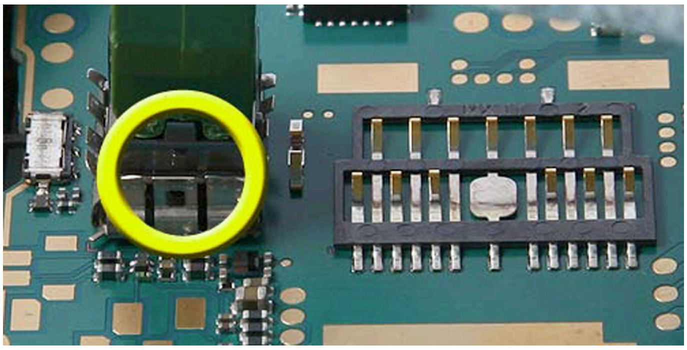
20. Place the engine PWB on the A-cover; A-cover functions as support when replacing the camera module.



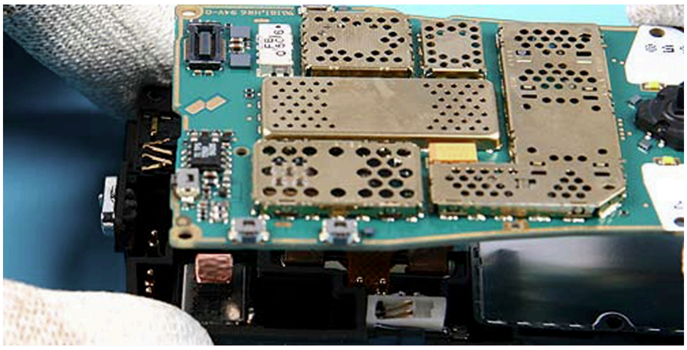
21. Use SS-15 to attach the camera module.



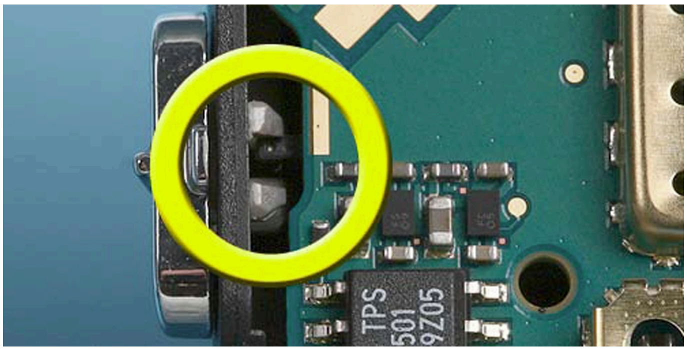
Note the guiding of the camera socket.



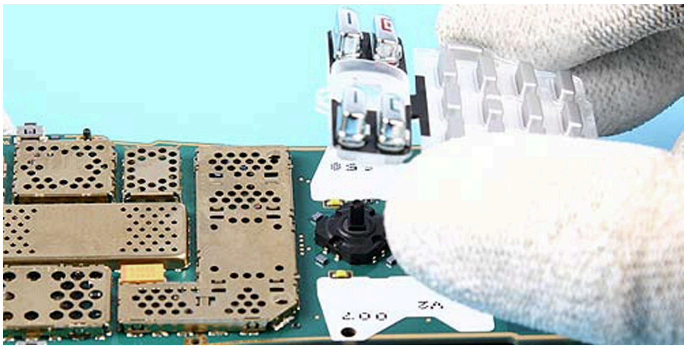
22. Place the engine module into the D-cover assembly.



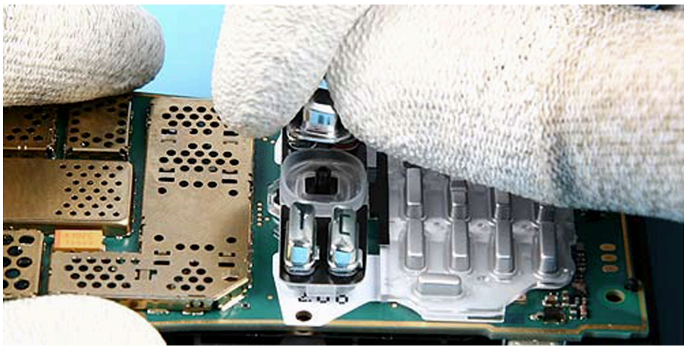
23. Check that the hold switch handle is in the correct position.



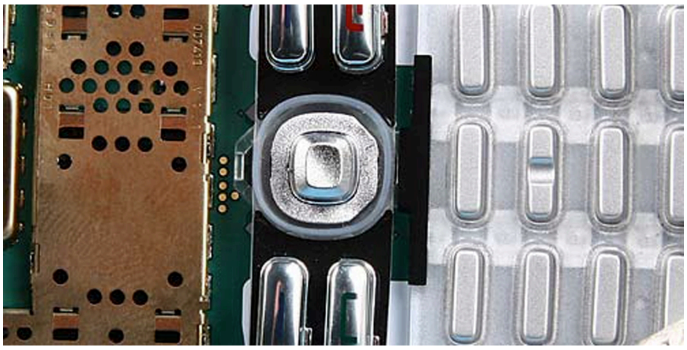
24. Place the T9 keymat onto the engine PWB.



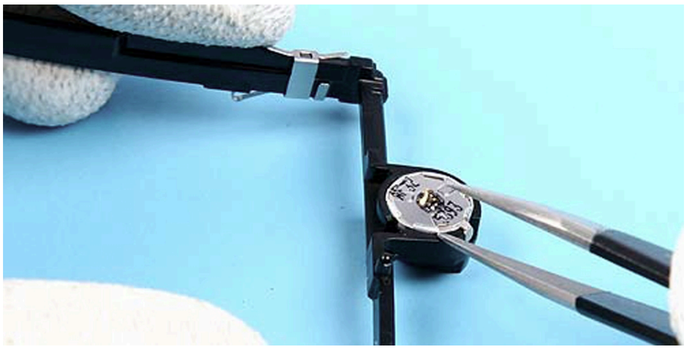
25. Attach the joystick button.



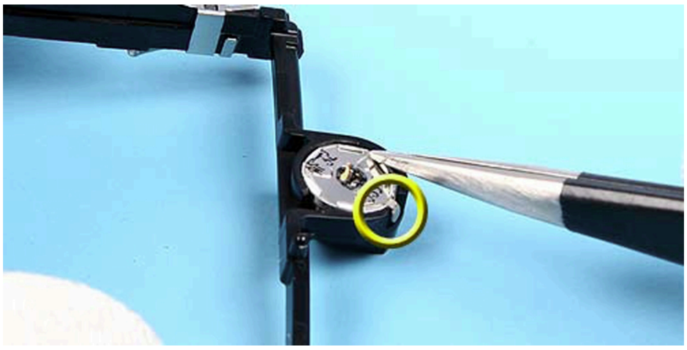
26. Check that the parts are correctly placed.



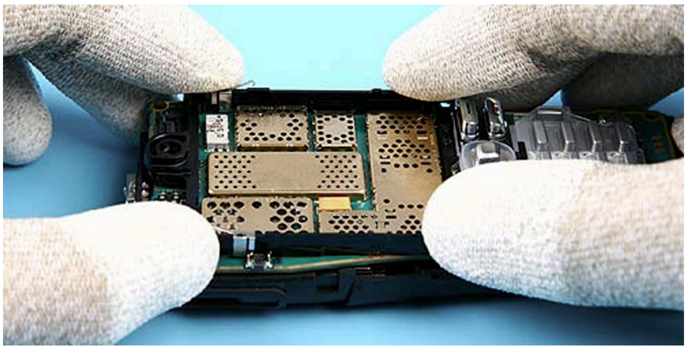
27. Use tweezers to replace the earpiece.
    Note the grounding clips of the display frame.



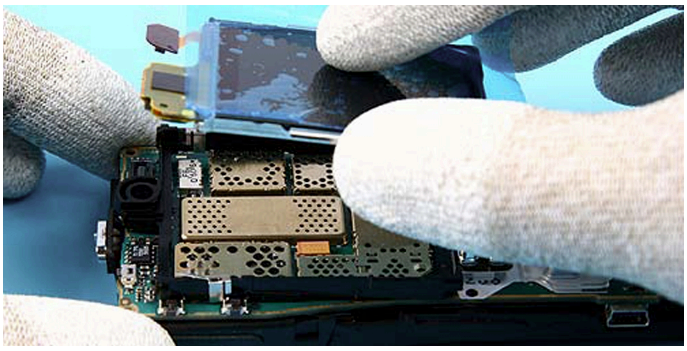
Note: Be careful not to damage the guiding pin of the earpiece.

- 

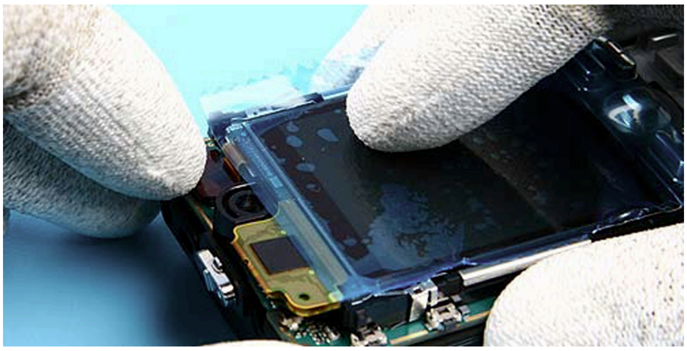
28. Place the display frame onto the engine module.



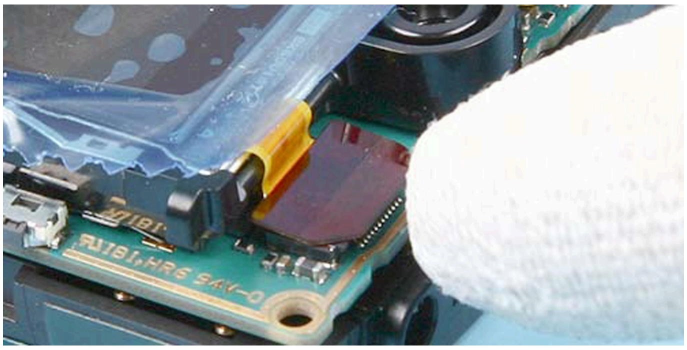
29. Position the LCD and place it on the engine PWB.



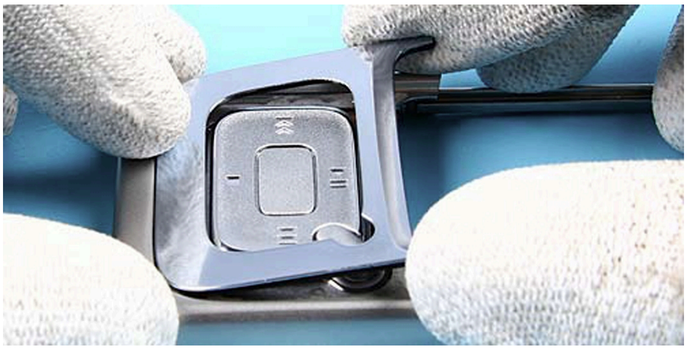
30. Attach the display flex connector.



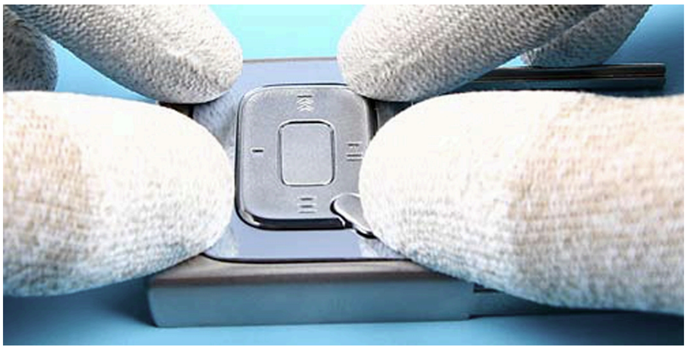
31. Check that flex connector is in the correct position before continuing.



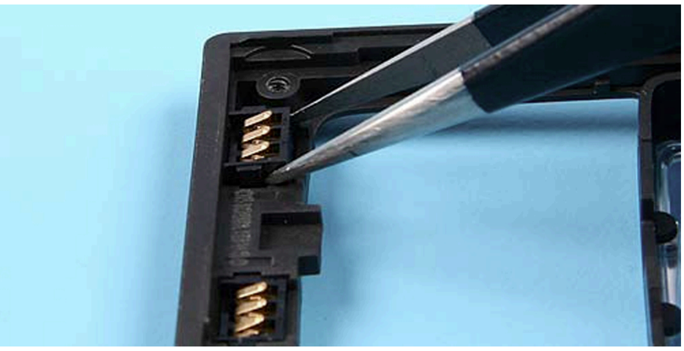
32. Attach the slide bezel; use new adhesive.



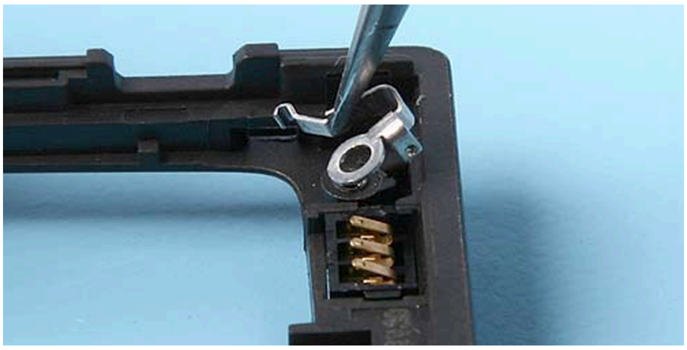
33. Align the bezel correctly, and press it down gently to fix it.



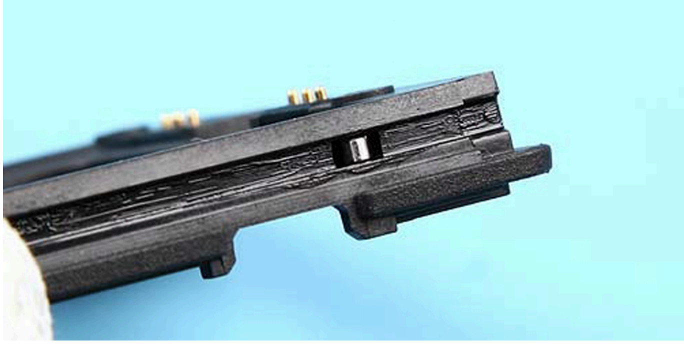
34. Insert the two slide connector pogos.



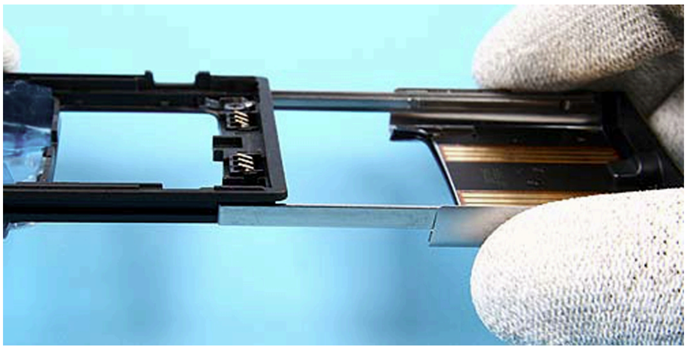
35. Insert the rail spring L.



36. Check that the rail spring is in the correct position before continuing.



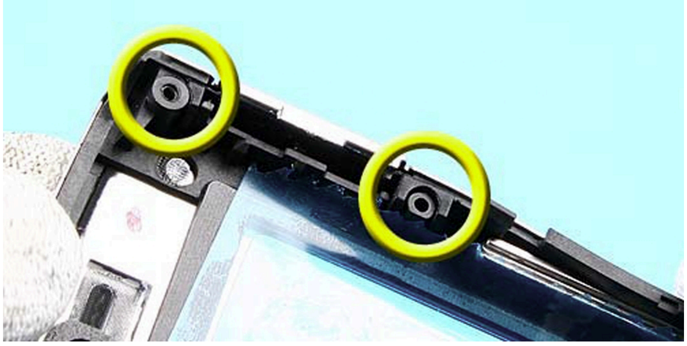
37. Attach the slide.



38. Check the functionality of the rail spring. The slide must stop properly at the end position.

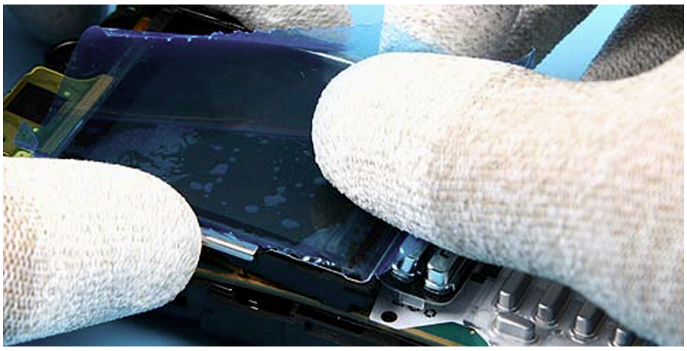
39. Attach the volume key hardtop.

    The following picture shows the correct positioning:

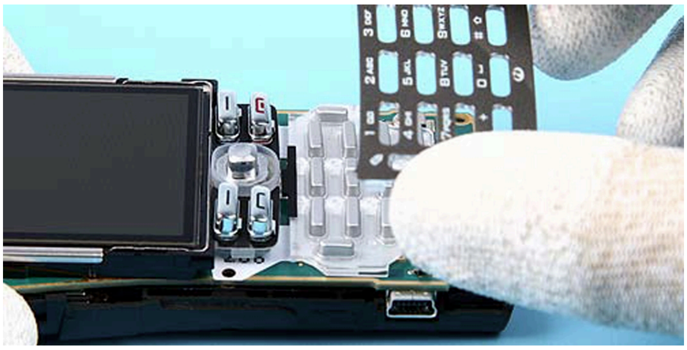


40. Attach the menu key hardtop.

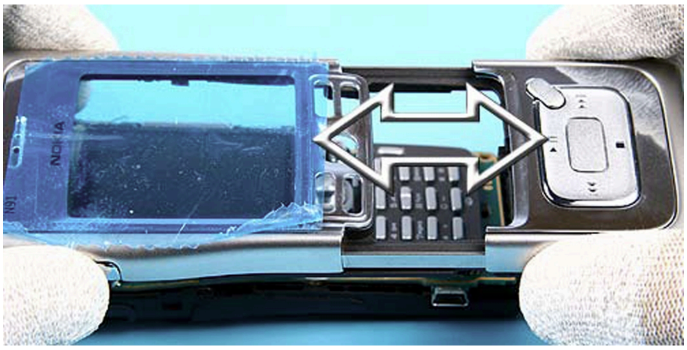
41. Remove the plastic film from the LCD.



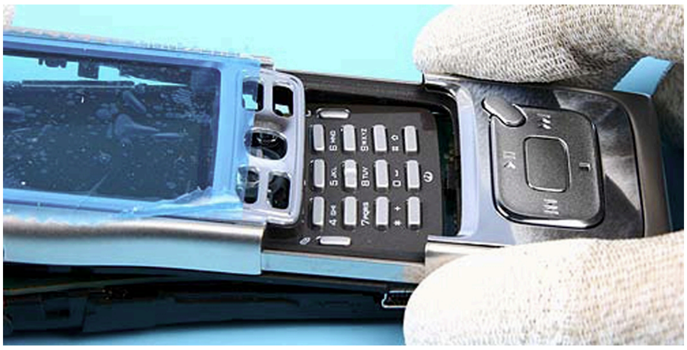
42. Attach the bezel cover.



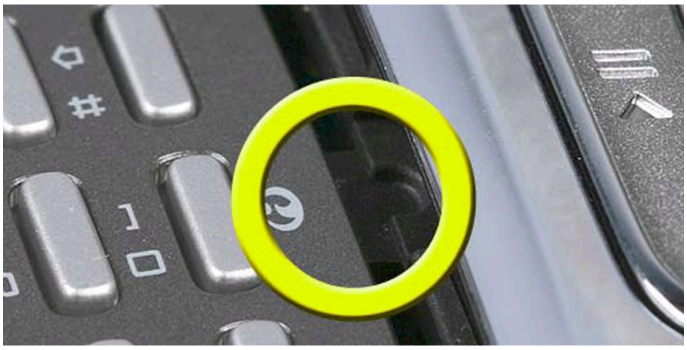
43. Pull the slide open.



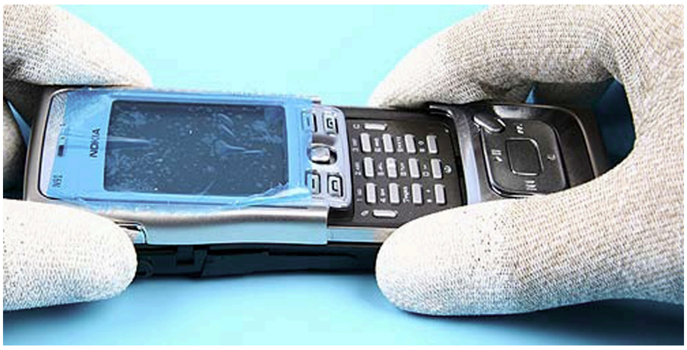
44. Attach the slide assembly beginning from the bottom end of the phone.



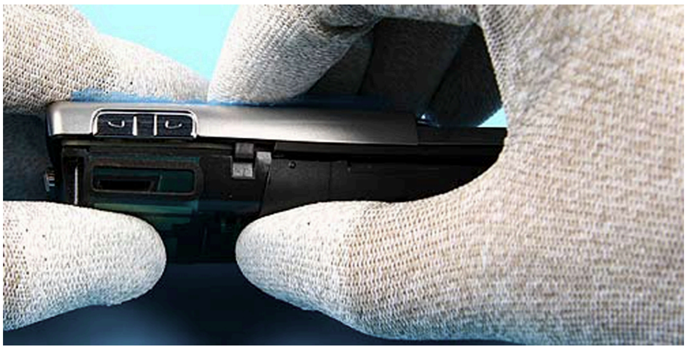
Note: Note the latch is located under the bezel cover:

- 

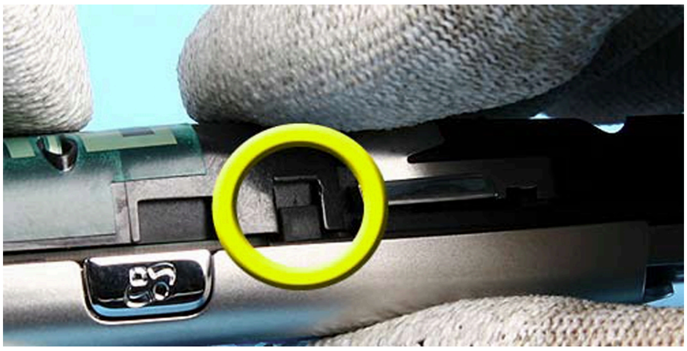
45. Carefully push down the assembly.



46. Lock the clips.

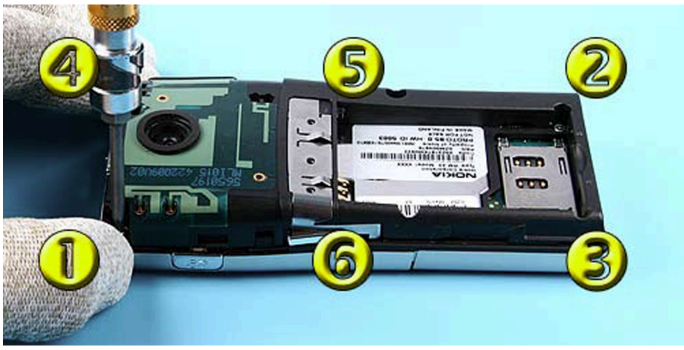


47. Ensure both clips are locked securely.

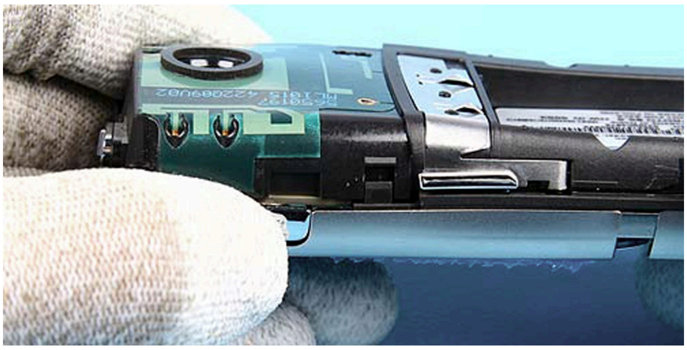


48. Insert screws.

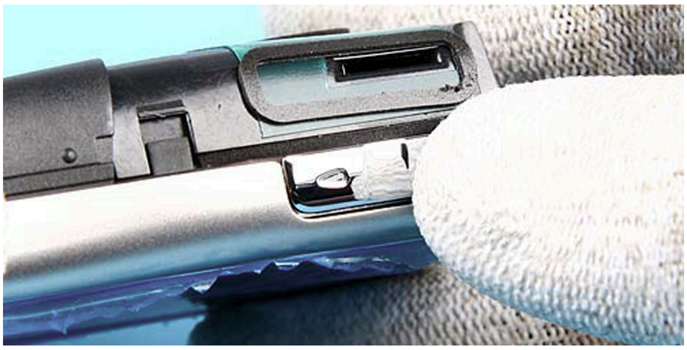
    Note: To prevent damage to the plastic threads, first turn the screws slightly left. Then tighten them in the shown order with a torque of 28 Ncm.



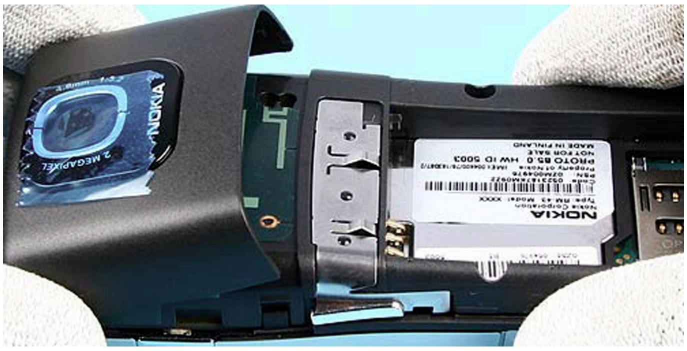
49. Check that the menu key hardtop works properly.



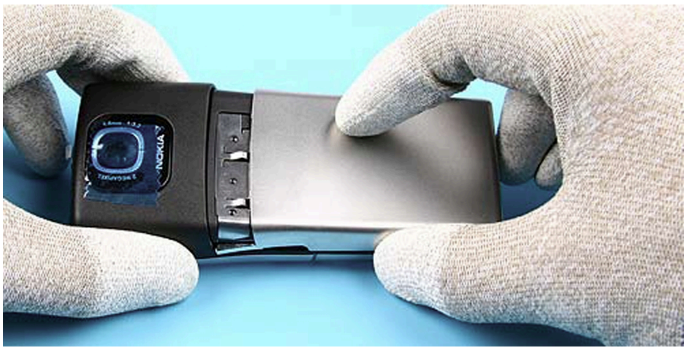
50. Check that the volume key hardtop works properly.



51. Attach the antenna cover beginning from the top end of the phone.



52. Attach the B-cover.



53. Check the LCD window for cleanness.

6 — BB Troubleshooting and Tuning Guide

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Table of Contents

Baseband troubleshooting....6–5
Dead or jammed device troubleshooting....6–7
Power key troubleshooting....6–9
General power checking troubleshooting....6–10
Battery current measuring fault troubleshooting....6–12
Flash programming fault troubleshooting....6–13
Clocking troubleshooting....6–16
Application processor troubleshooting....6–17
Application processor memory troubleshooting....6–21
Charging troubleshooting....6–23
Hard disk drive troubleshooting....6–24
Accelerometer troubleshooting....6–26
USB troubleshooting....6–27
Battery cover sensor switch troubleshooting....6–30
CMT SDRAM memory troubleshooting....6–31
CMT NOR flash fault troubleshooting....6–33
SIM card troubleshooting....6–35
Keyboard troubleshooting....6–36
Lock switch troubleshooting....6–38
Slide switch troubleshooting....6–39
WLAN troubleshooting....6–40
FM radio troubleshooting....6–41
Certificate restoring for BB5.0 products....6–41
Display module troubleshooting....6–47
    General instructions for display troubleshooting....6–47
    Display troubleshooting....6–49
    Display and keyboard backlight troubleshooting....6–50
    LED driver troubleshooting....6–52
Bluetooth troubleshooting....6–52
    Introduction to Bluetooth troubleshooting....6–52
    Bluetooth settings for Phoenix....6–53
    Bluetooth self tests in Phoenix....6–54
    Bluetooth BER failure troubleshooting....6–56
    BT audio failure troubleshooting....6–59
Audio troubleshooting....6–60
    Audio troubleshooting test instructions....6–60
    Internal earpiece troubleshooting....6–64
    Internal microphone troubleshooting....6–65
    Internal handsfree speaker troubleshooting....6–66
    External microphone troubleshooting....6–67
    External earpiece troubleshooting....6–68
    Vibra troubleshooting....6–69
Baseband manual tuning guide....6–70
    Energy management calibration....6–70

List of Tables

Table 12 Display module troubleshooting cases....6–47
Table 13 Pixel defects....6–47
Table 14 Calibration value limits....6–70

List of Figures

Figure 35 Main troubleshooting tree....6–6
Figure 36 Take single trig measurement for the rise of the BSI signal....6–15
Figure 37 Take single trig measurement for the rise of the BSI signal....6–15
Figure 38 SysCLK from J2800 and J2801....6–19
Figure 39 SleepCLK from J2217....6–20
Figure 40 COMBO NAND in boot pic 1....6–22
Figure 41 USB 1: D-TXD (J2063) and D+RXD (J2061) voltage levels when USB connected....6–28
Figure 42 Take single triggered measurement on the rising edge of the Helen usb0_txen line J4813.... 6–29
Figure 43 CMT SDRAM CLK from pin J2806....6–32
Figure 44 NOR CLK from J2813....6–34
Figure 45 SIM interface signals....6–36
Figure 46 BER test result....6–54
Figure 47 Bluetooth self tests in Phoenix....6–55
Figure 48 BT BER failure reference picture....6–58
Figure 49 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected....6–62
Figure 50 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected....6–62
Figure 51 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.... 6–63

Baseband troubleshooting

Context

This section is intended to be a guide for localising and repairing electrical faults. The fault repairing is divided into troubleshooting paths. The following main troubleshooting tree describes the different baseband troubleshooting paths to be followed in fault situations.

Troubleshooting flow

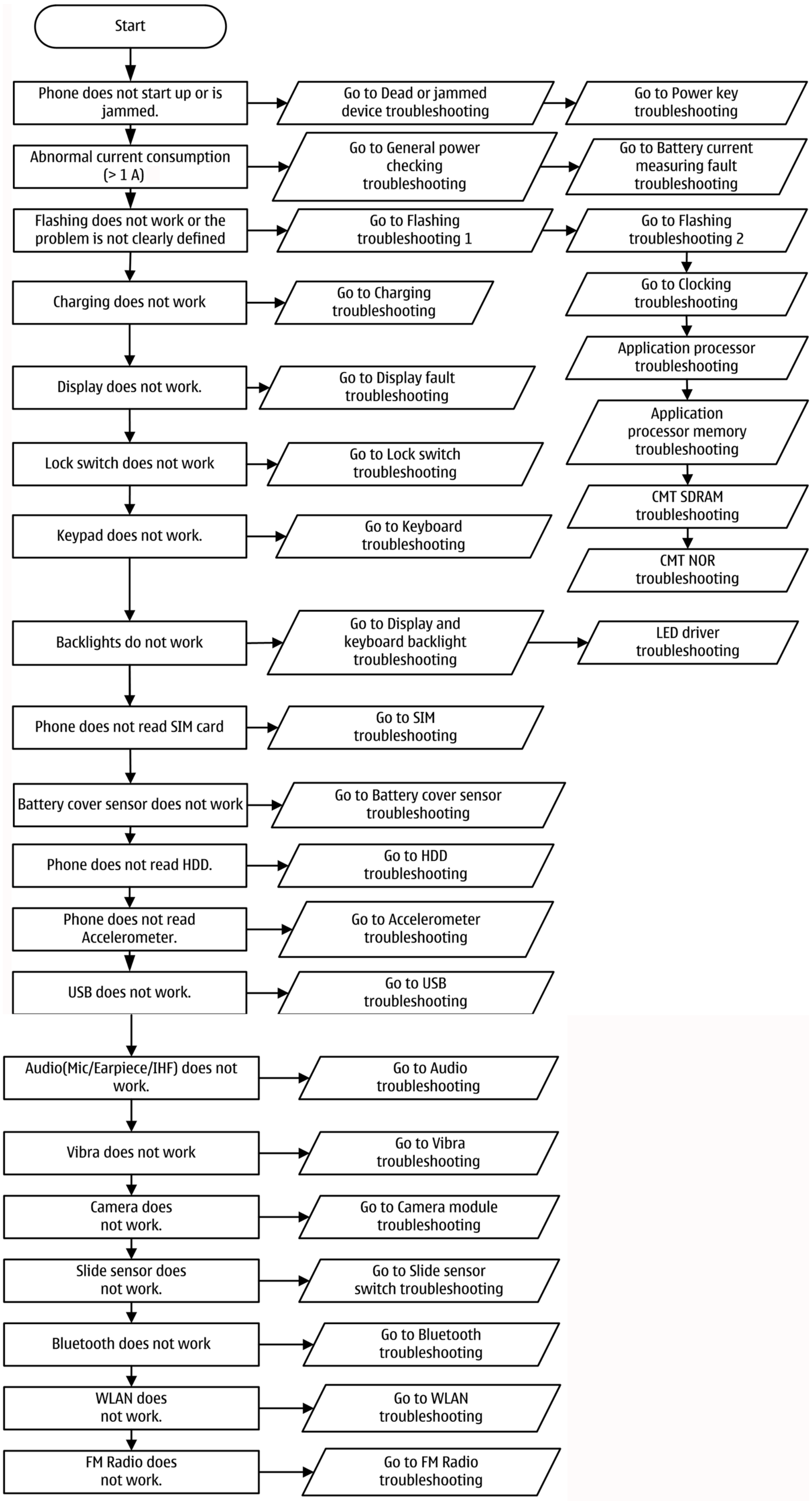
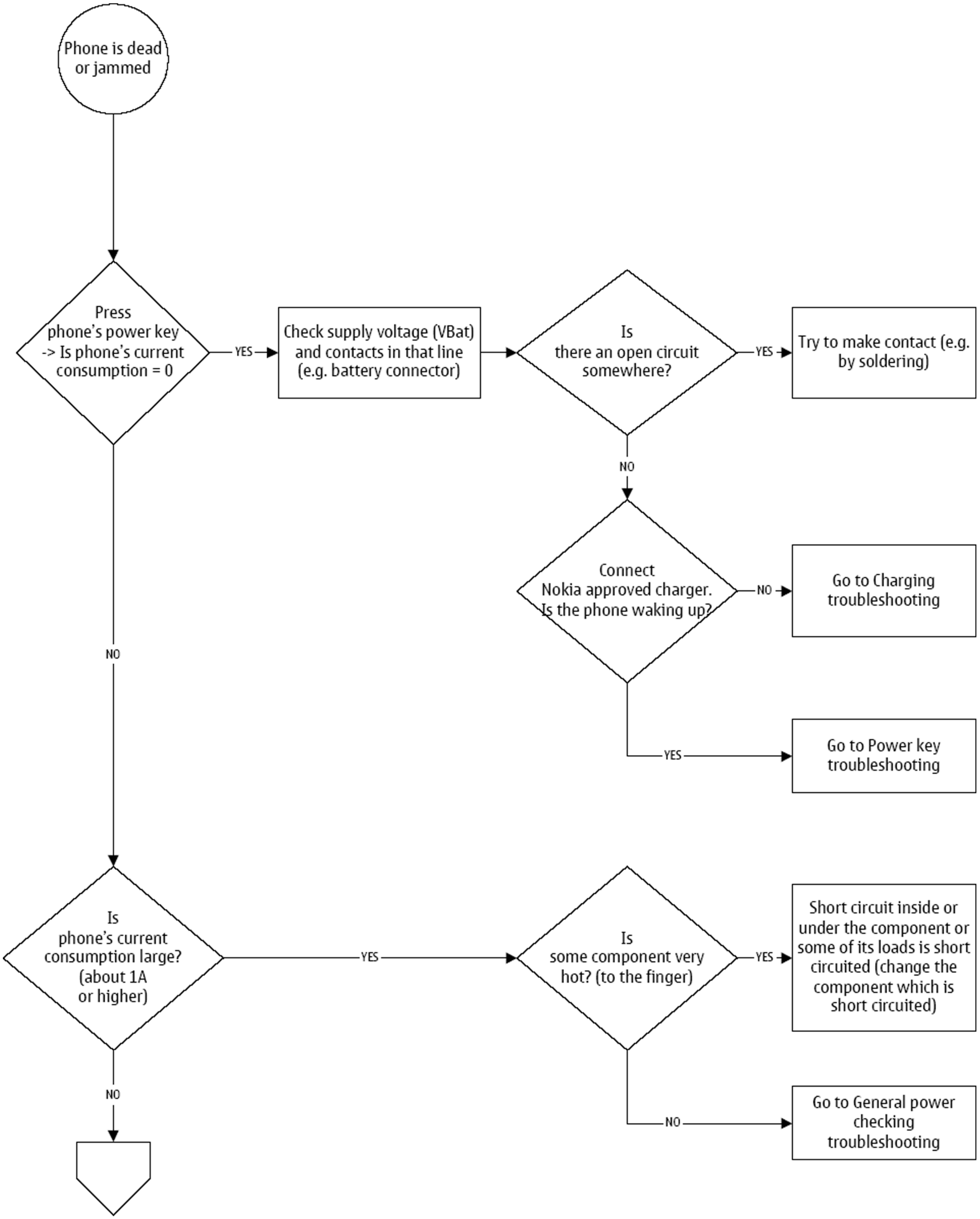
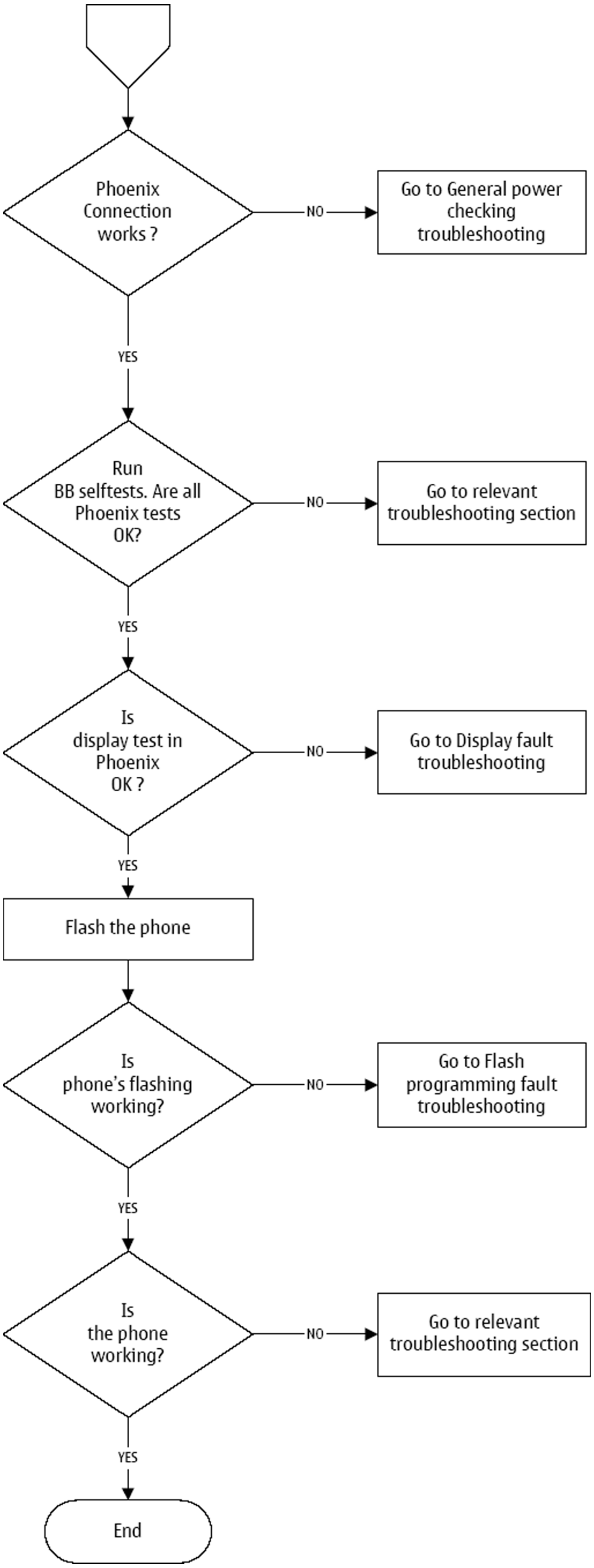

Start
Phone does not start up or is jammed.
Go to Dead or jammed device troubleshooting
Go to Power key troubleshooting
Abnormal current consumption (> 1 A)
Go to General power checking troubleshooting
Go to Battery current measuring fault troubleshooting
Flashing does not work or the problem is not clearly defined
Go to Flashing troubleshooting 1
Go to Flashing troubleshooting 2
Go to Clocking troubleshooting
Application processor troubleshooting
Application processor memory troubleshooting
CMT SDRAM troubleshooting
CMT NOR troubleshooting
Charging does not work
Go to Charging troubleshooting
Display does not work.
Go to Display fault troubleshooting
Lock switch does not work
Go to Lock switch troubleshooting
Keypad does not work.
Go to Keyboard troubleshooting
Backlights do not work
Go to Display and keyboard backlight troubleshooting
LED driver troubleshooting
Phone does not read SIM card
Go to SIM troubleshooting
Battery cover sensor does not work
Go to Battery cover sensor troubleshooting
Phone does not read HDD.
Go to HDD troubleshooting
Phone does not read Accelerometer.
Go to Accelerometer troubleshooting
USB does not work.
Go to USB troubleshooting
Audio(Mic/Earpiece/IHF) does not work.
Go to Audio troubleshooting
Vibra does not work
Go to Vibra troubleshooting
Camera does not work.
Go to Camera module troubleshooting
Slide sensor does not work.
Go to Slide sensor switch troubleshooting
Bluetooth does not work
Go to Bluetooth troubleshooting
WLAN does not work.
Go to WLAN troubleshooting
FM Radio does not work.
Go to FM Radio troubleshooting

Figure 35 Main troubleshooting tree

Dead or jammed device troubleshooting

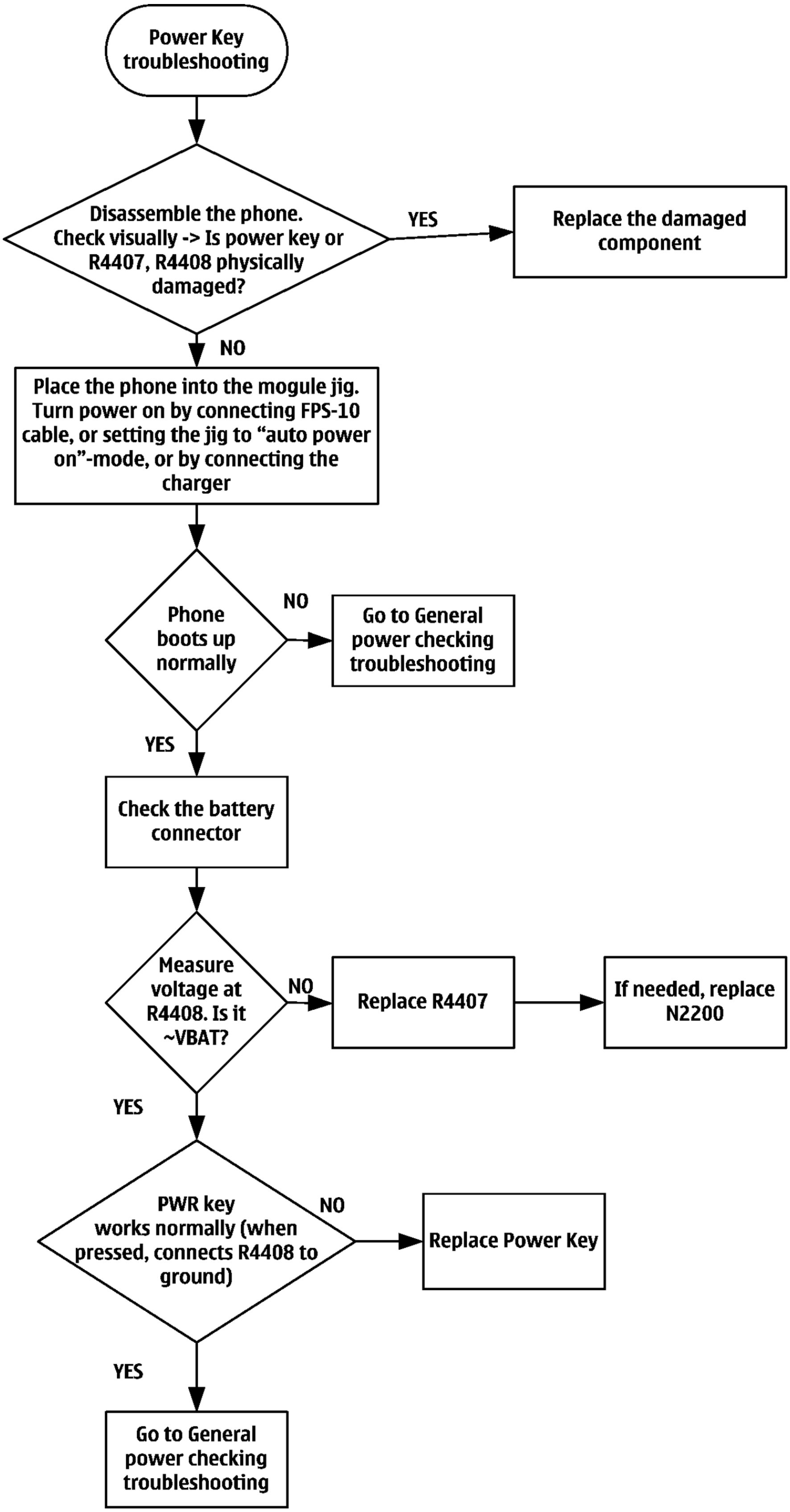
Troubleshooting flow


Phone is dead or jammed
Press phone's power key -> Is phone's current consumption = 0
YES
Check supply voltage (VBat) and contacts in that line (e.g. battery connector)
Is there an open circuit somewhere?
YES
Try to make contact (e.g. by soldering)
NO
Connect Nokia approved charger. Is the phone waking up?
NO
Go to Charging troubleshooting
YES
Go to Power key troubleshooting
NO
Is phone's current consumption large? (about 1A or higher)
YES
Is some component very hot? (to the finger)
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
Go to General power checking troubleshooting
NO


Phoenix Connection works ?
NO
Go to General power checking troubleshooting
YES
Run BB selftests. Are all Phoenix tests OK?
NO
Go to relevant troubleshooting section
YES
Is display test in Phoenix OK ?
NO
Go to Display fault troubleshooting
YES
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
End

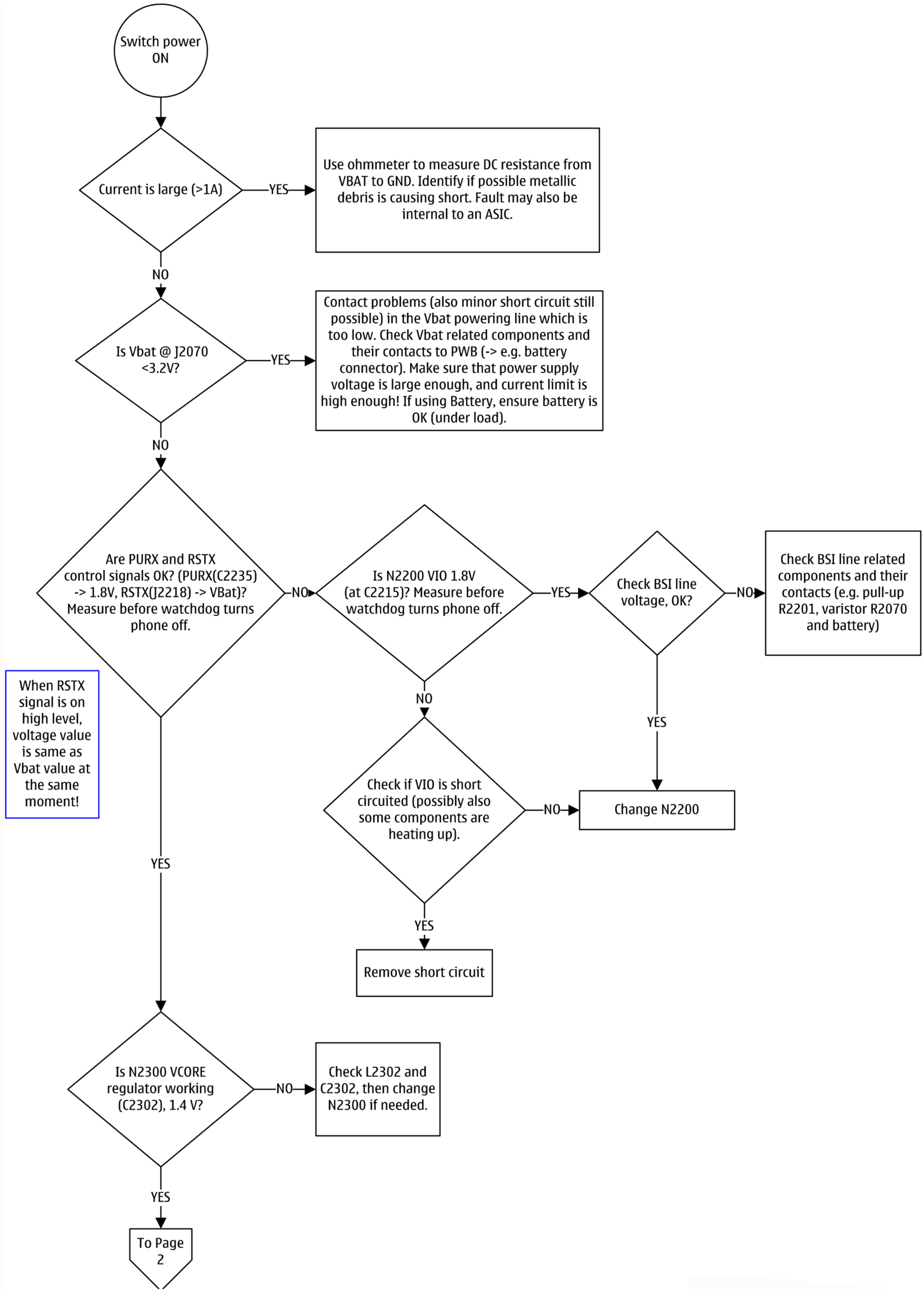
Power key troubleshooting

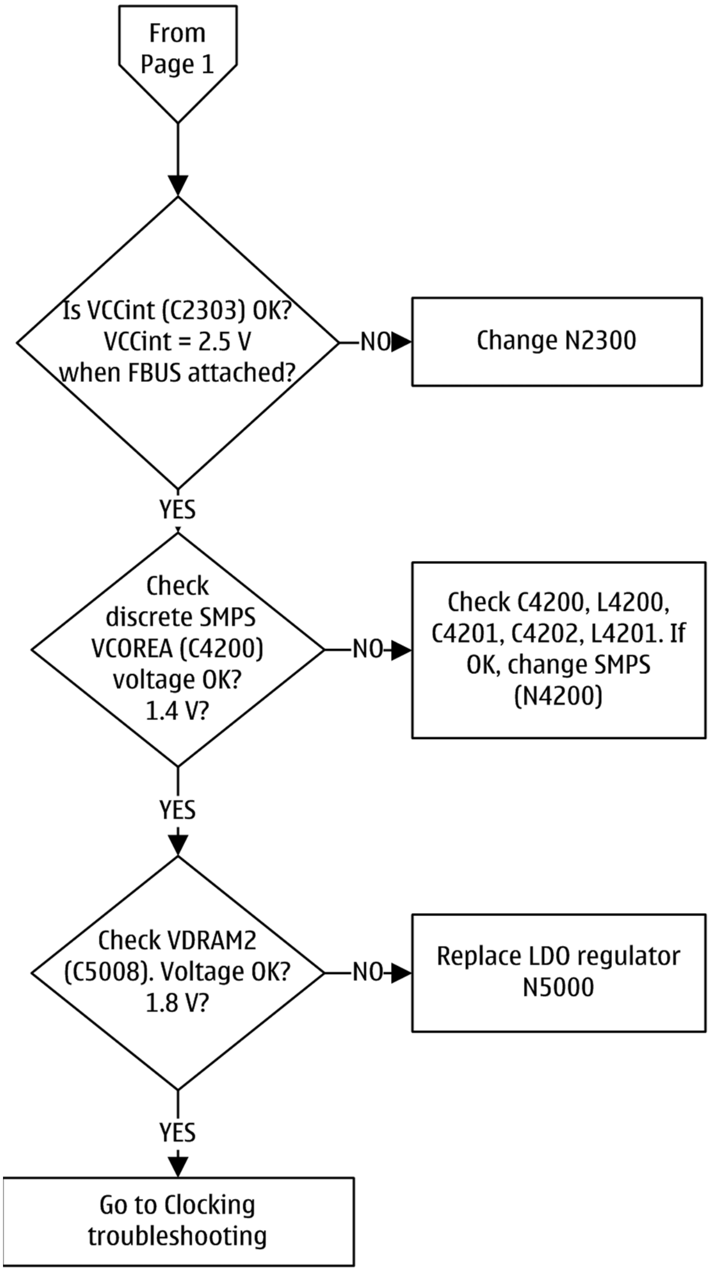
Troubleshooting flow


Power Key troubleshooting
Disassemble the phone. Check visually -> Is power key or R4407, R4408 physically damaged?
YES
Replace the damaged component
NO
Place the phone into the mogule jig. Turn power on by connecting FPS-10 cable, or setting the jig to "auto power on"-mode, or by connecting the charger
Phone boots up normally
NO
Go to General power checking troubleshooting
YES
Check the battery connector
Measure voltage at R4408. Is it ~VBAT?
NO
Replace R4407
If needed, replace N2200
YES
PWR key works normally (when pressed, connects R4408 to ground)
NO
Replace Power Key
YES
Go to General power checking troubleshooting

General power checking troubleshooting

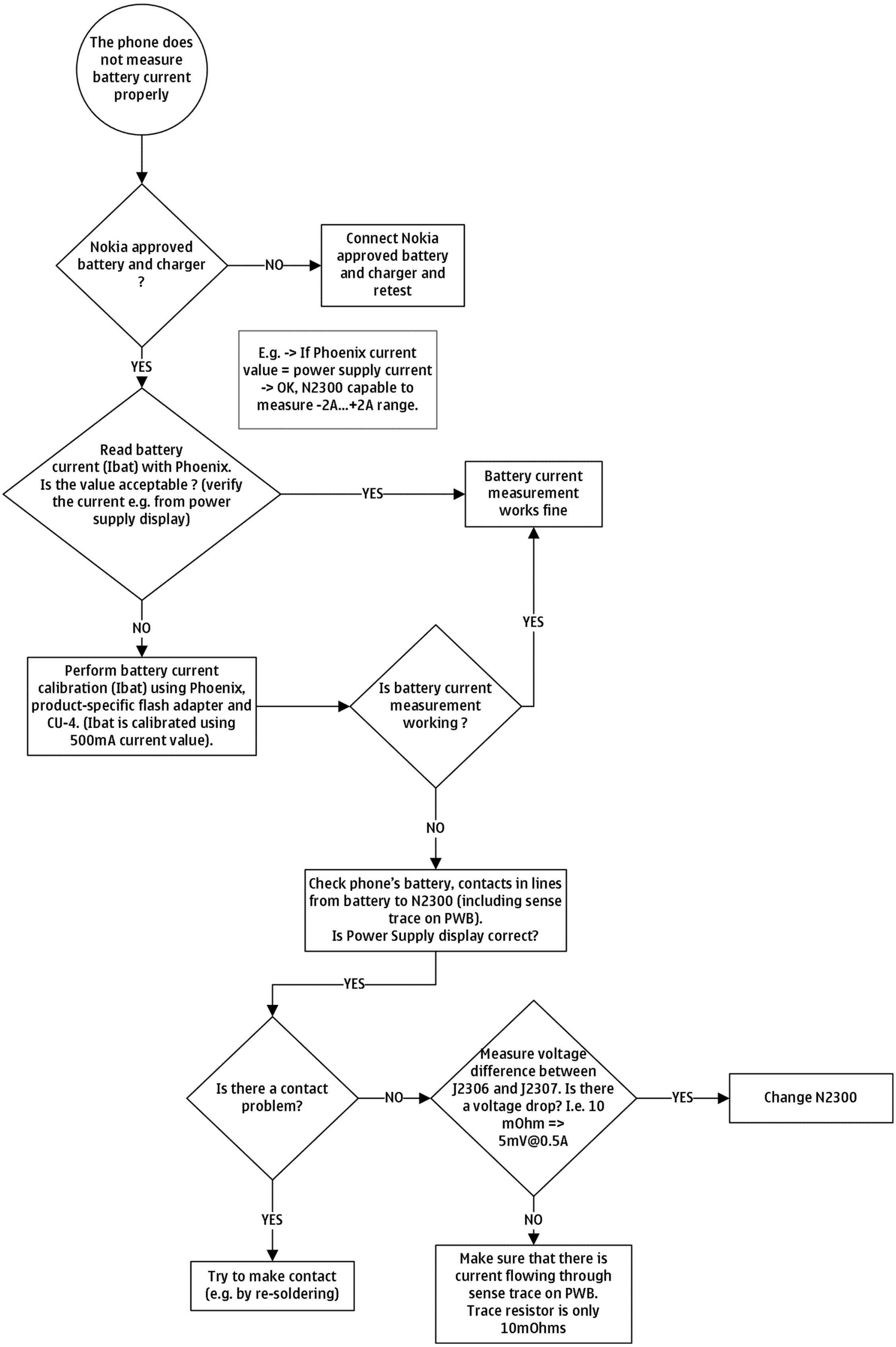
Troubleshooting flow


Switch power ON
Current is large (>1A)
YES
Use ohmmeter to measure DC resistance from VBAT to GND. Identify if possible metallic debris is causing short. Fault may also be internal to an ASIC.
NO
Is Vbat @ J2070 <3.2V?
YES
Contact problems (also minor short circuit still possible) in the Vbat powering line which is too low. Check Vbat related components and their contacts to PWB (-> e.g. battery connector). Make sure that power supply voltage is large enough, and current limit is high enough! If using Battery, ensure battery is OK (under load).
NO
Are PURX and RSTX control signals OK? (PURX(C2235) -> 1.8V, RSTX(J2218) -> VBat)? Measure before watchdog turns phone off.
NO
Is N2200 VIO 1.8V (at C2215)? Measure before watchdog turns phone off.
YES
Check BSI line voltage, OK?
NO
Check BSI line related components and their contacts (e.g. pull-up R2201, varistor R2070 and battery)
When RSTX signal is on high level, voltage value is same as Vbat value at the same moment!
NO
YES
Check if VIO is short circuited (possibly also some components are heating up).
NO
Change N2200
YES
YES
Remove short circuit
Is N2300 VCORE regulator working (C2302), 1.4 V?
NO
Check L2302 and C2302, then change N2300 if needed.
YES
To Page 2


From Page 1
Is VCCint (C2303) OK? VCCint = 2.5 V when FBUS attached?
NO
Change N2300
YES
Check discrete SMPS VCOREA (C4200) voltage OK? 1.4 V?
NO
Check C4200, L4200, C4201, C4202, L4201. If OK, change SMPS (N4200)
YES
Check VDRAM2 (C5008). Voltage OK? 1.8 V?
NO
Replace LDO regulator N5000
YES
Go to Clocking troubleshooting

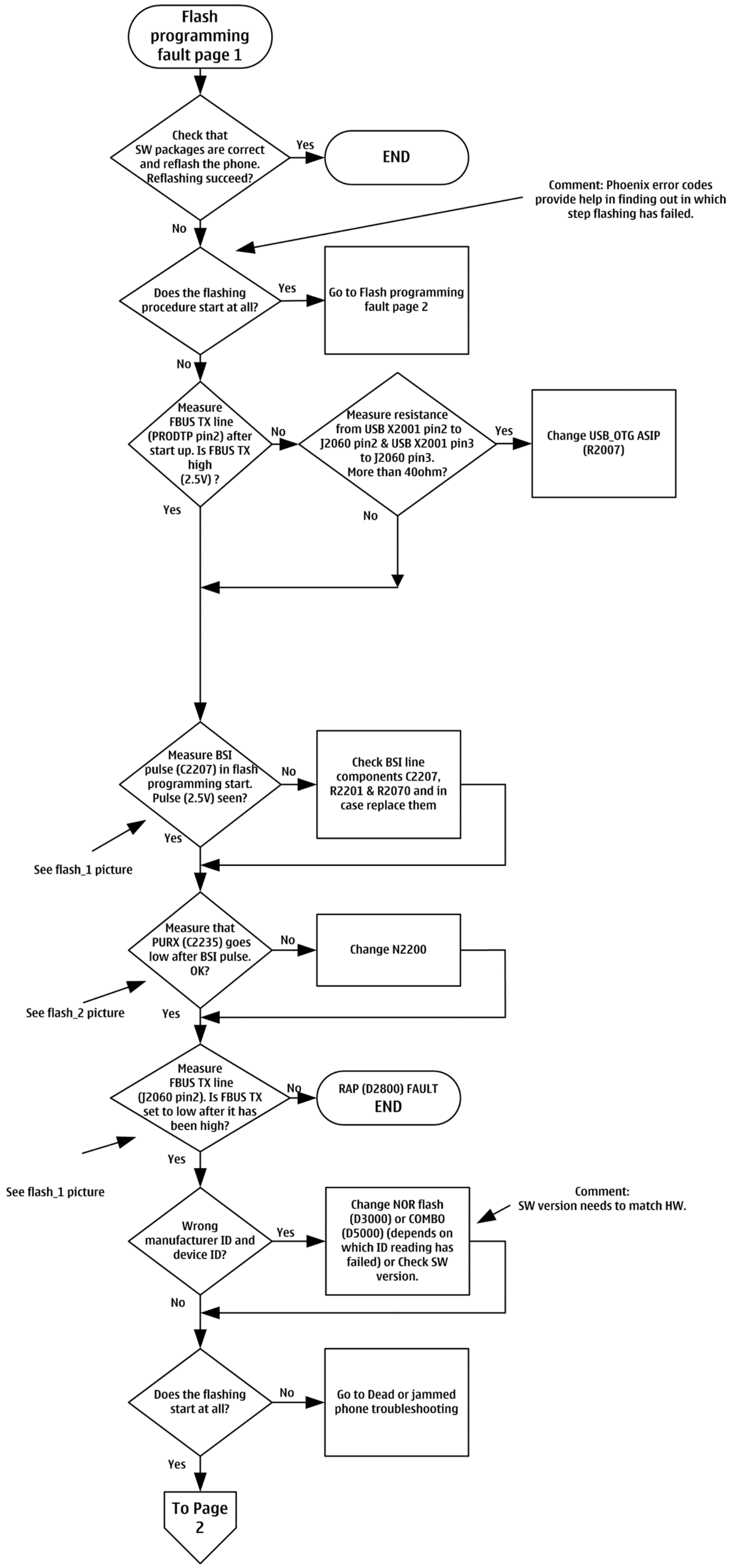
Battery current measuring fault troubleshooting

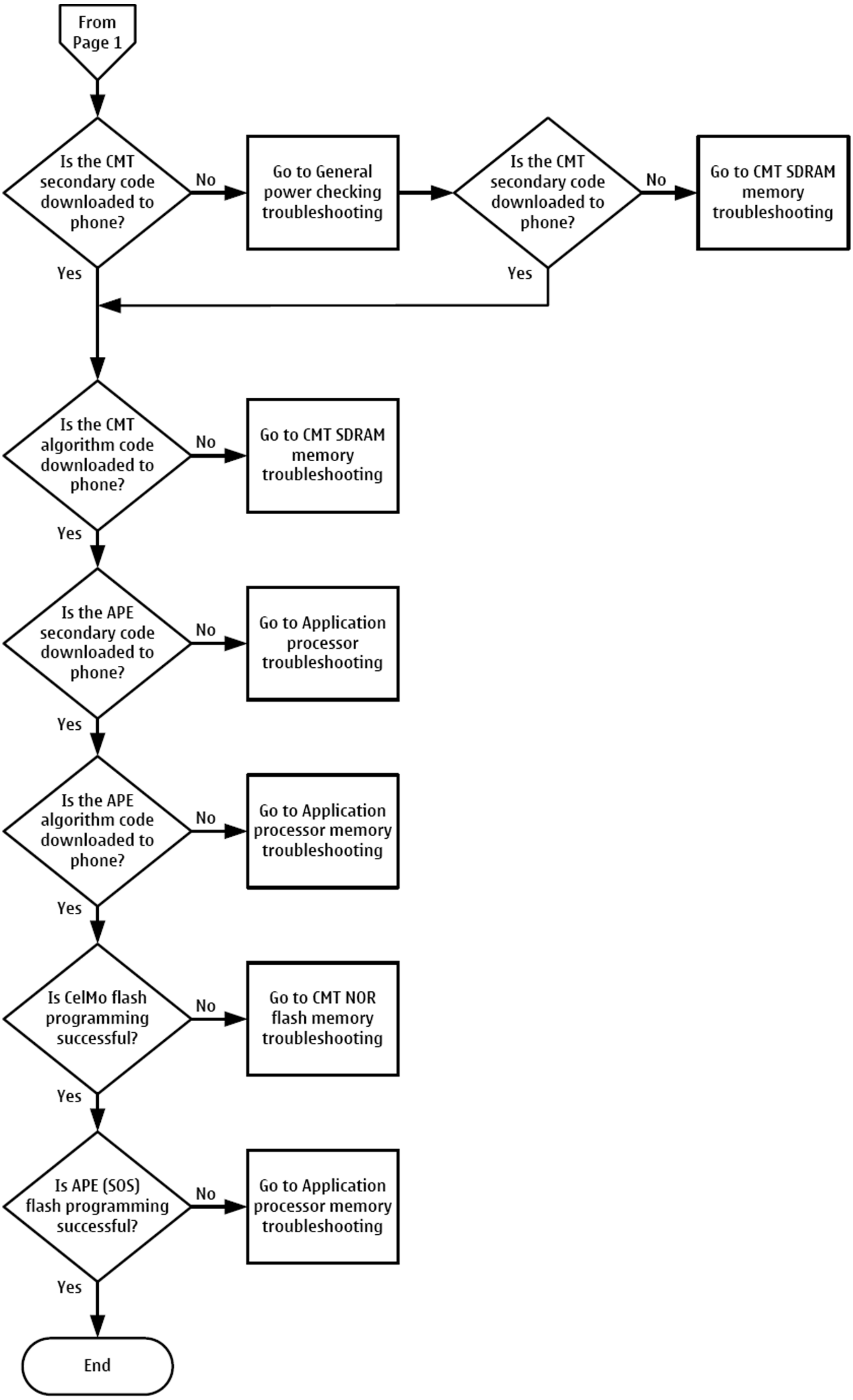
Troubleshooting flow


The phone does not measure battery current properly
Nokia approved battery and charger ?
NO
Connect Nokia approved battery and charger and retest
E.g. -> If Phoenix current value = power supply current -> OK, N2300 capable to measure -2A...+2A range.
YES
Read battery current (Ibat) with Phoenix. Is the value acceptable ? (verify the current e.g. from power supply display)
YES
Battery current measurement works fine
NO
Perform battery current calibration (Ibat) using Phoenix, product-specific flash adapter and CU-4. (Ibat is calibrated using 500mA current value).
Is battery current measurement working ?
YES
NO
Check phone's battery, contacts in lines from battery to N2300 (including sense trace on PWB). Is Power Supply display correct?
YES
Is there a contact problem?
NO
Measure voltage difference between J2306 and J2307. Is there a voltage drop? I.e. 10 mOhm => 5mV@0.5A
YES
Change N2300
YES
Try to make contact (e.g. by re-soldering)
NO
Make sure that there is current flowing through sense trace on PWB. Trace resistor is only 10mOhms

Flash programming fault troubleshooting

Troubleshooting flow


Flash programming fault page 1
Check that SW packages are correct and reflash the phone. Reflashing succeed?
Yes
END
No
Comment: Phoenix error codes provide help in finding out in which step flashing has failed.
Does the flashing procedure start at all?
Yes
Go to Flash programming fault page 2
No
Measure FBUS TX line (PRODTP pin2) after start up. Is FBUS TX high (2.5V) ?
No
Measure resistance from USB X2001 pin2 to J2060 pin2 & USB X2001 pin3 to J2060 pin3. More than 40ohm?
Yes
Change USB_OTG ASIP (R2007)
No
Yes
Measure BSI pulse (C2207) in flash programming start. Pulse (2.5V) seen?
No
Check BSI line components C2207, R2201 & R2070 and in case replace them
Yes
See flash_1 picture
Measure that PURX (C2235) goes low after BSI pulse. OK?
No
Change N2200
See flash_2 picture
Yes
Measure FBUS TX line (J2060 pin2). Is FBUS TX set to low after it has been high?
No
RAP (D2800) FAULT END
Yes
See flash_1 picture
Wrong manufacturer ID and device ID?
Yes
Change NOR flash (D3000) or COMBO (D5000) (depends on which ID reading has failed) or Check SW version.
Comment: SW version needs to match HW.
No
Does the flashing start at all?
No
Go to Dead or jammed phone troubleshooting
Yes
To Page 2


From Page 1
Is the CMT secondary code downloaded to phone?
No
Go to General power checking troubleshooting
Is the CMT secondary code downloaded to phone?
No
Go to CMT SDRAM memory troubleshooting
Yes
Yes
Is the CMT algorithm code downloaded to phone?
No
Go to CMT SDRAM memory troubleshooting
Yes
Is the APE secondary code downloaded to phone?
No
Go to Application processor troubleshooting
Yes
Is the APE algorithm code downloaded to phone?
No
Go to Application processor memory troubleshooting
Yes
Is CelMo flash programming successful?
No
Go to CMT NOR flash memory troubleshooting
Yes
Is APE (SOS) flash programming successful?
No
Go to Application processor memory troubleshooting
Yes
End

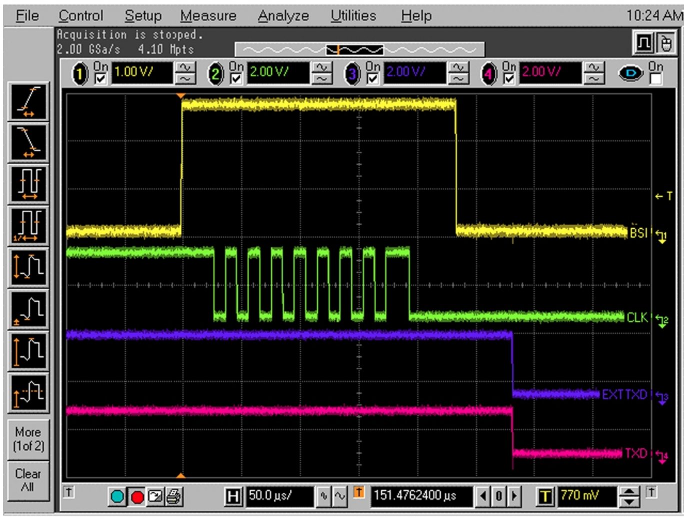
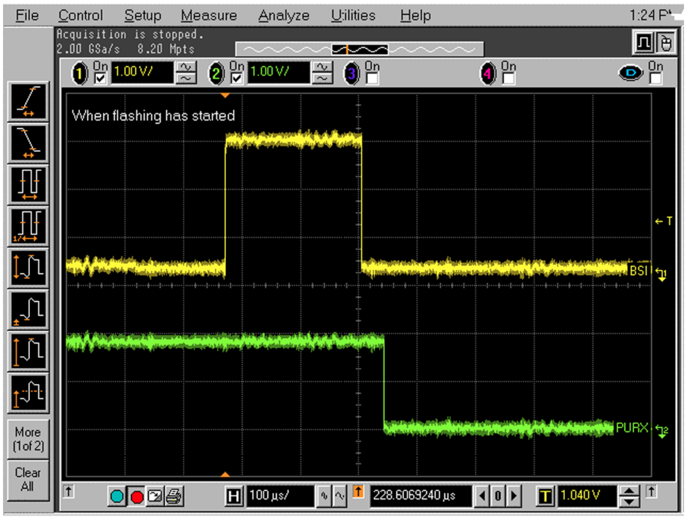

File Control Setup Measure Analyze Utilities Help
10:24 AM
Acquisition is stopped.
2.00 GSa/s 4.10 Mpts
1.00 V/
2.00 V/
2.00 V/
2.00 V/
BSI
CLK
EXTTXD
TXD
More (1of 2)
Clear All
50.0 µs/
151.4762400 µs
770 mV

Figure 36 Take single trig measurement for the rise of the BSI signal

Saved: 05 JUL 2004 13:24:19

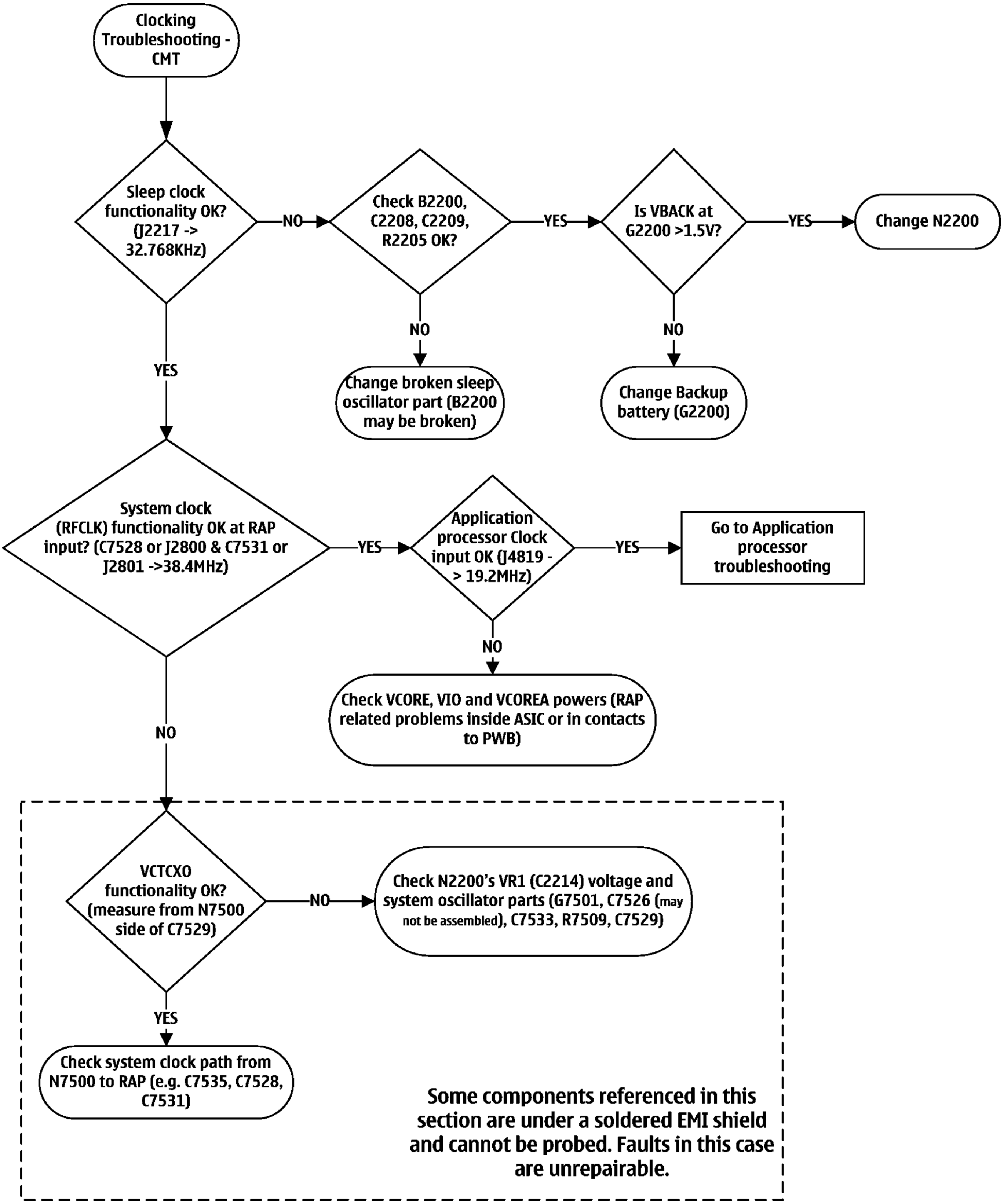

When flashing has started

File Control Setup Measure Analyze Utilities Help
1:24 PM
Acquisition is stopped.
2.00 GSa/s 8.20 Mpts
1.00 V/
1.00 V/
BSI
PURX
More (1of 2)
Clear All
100 µs/
228.6069240 µs
1.040 V

Figure 37 Take single trig measurement for the rise of the BSI signal

Clocking troubleshooting

Troubleshooting flow

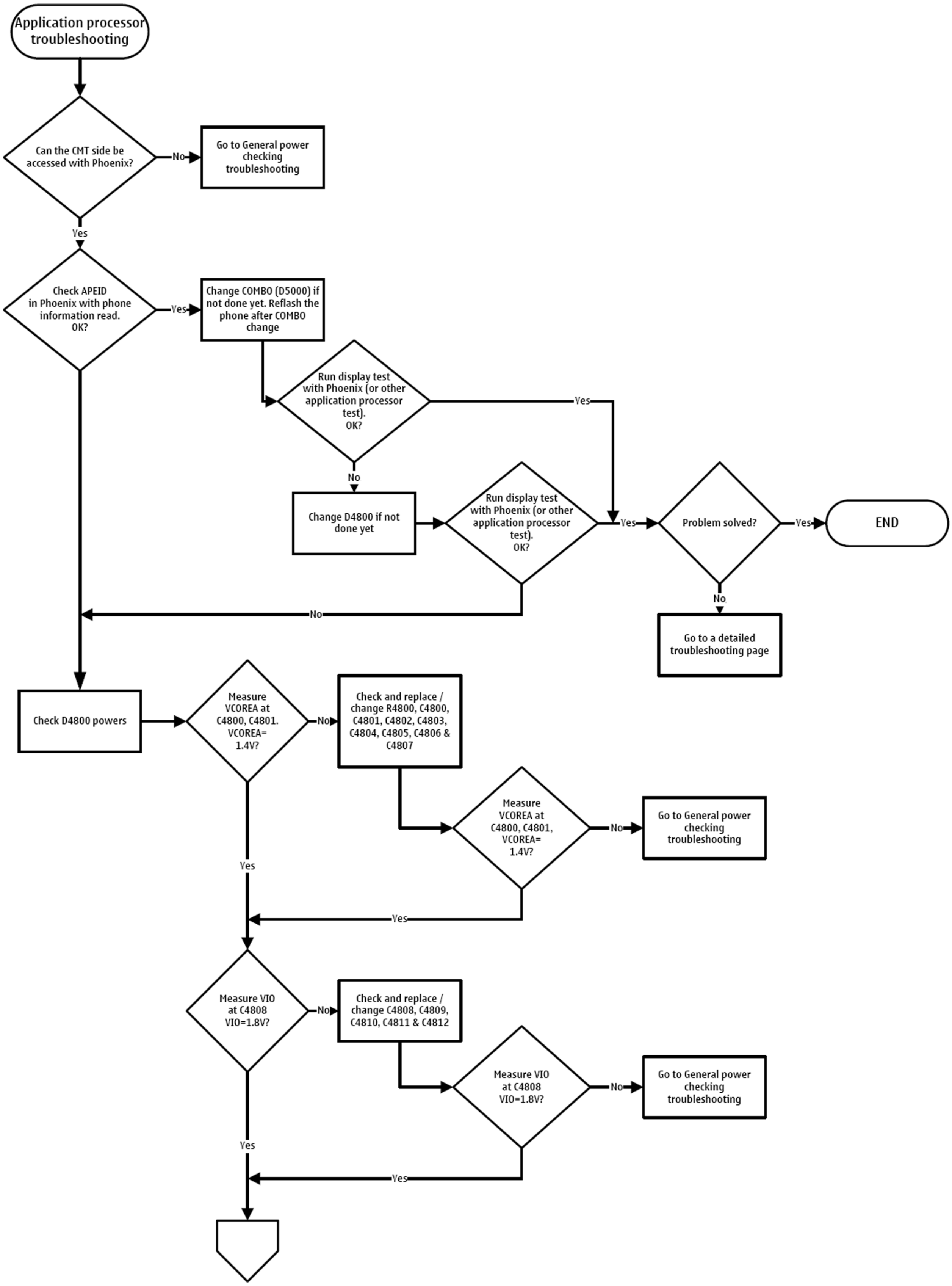

Clocking Troubleshooting - CMT
Sleep clock functionality OK? (J2217 -> 32.768KHz)
NO
Check B2200, C2208, C2209, R2205 OK?
YES
Is VBACK at G2200 >1.5V?
YES
Change N2200
NO
Change broken sleep oscillator part (B2200 may be broken)
NO
Change Backup battery (G2200)
YES
System clock (RFCLK) functionality OK at RAP input? (C7528 or J2800 & C7531 or J2801 ->38.4MHz)
YES
Application processor Clock input OK (J4819 -> 19.2MHz)
YES
Go to Application processor troubleshooting
NO
Check VCORE, VIO and VCOREA powers (RAP related problems inside ASIC or in contacts to PWB)
NO
VCTCXO functionality OK? (measure from N7500 side of C7529)
NO
Check N2200's VR1 (C2214) voltage and system oscillator parts (G7501, C7526 (may not be assembled), C7533, R7509, C7529)
YES
Check system clock path from N7500 to RAP (e.g. C7535, C7528, C7531)
Some components referenced in this section are under a soldered EMI shield and cannot be probed. Faults in this case are unrepairable.

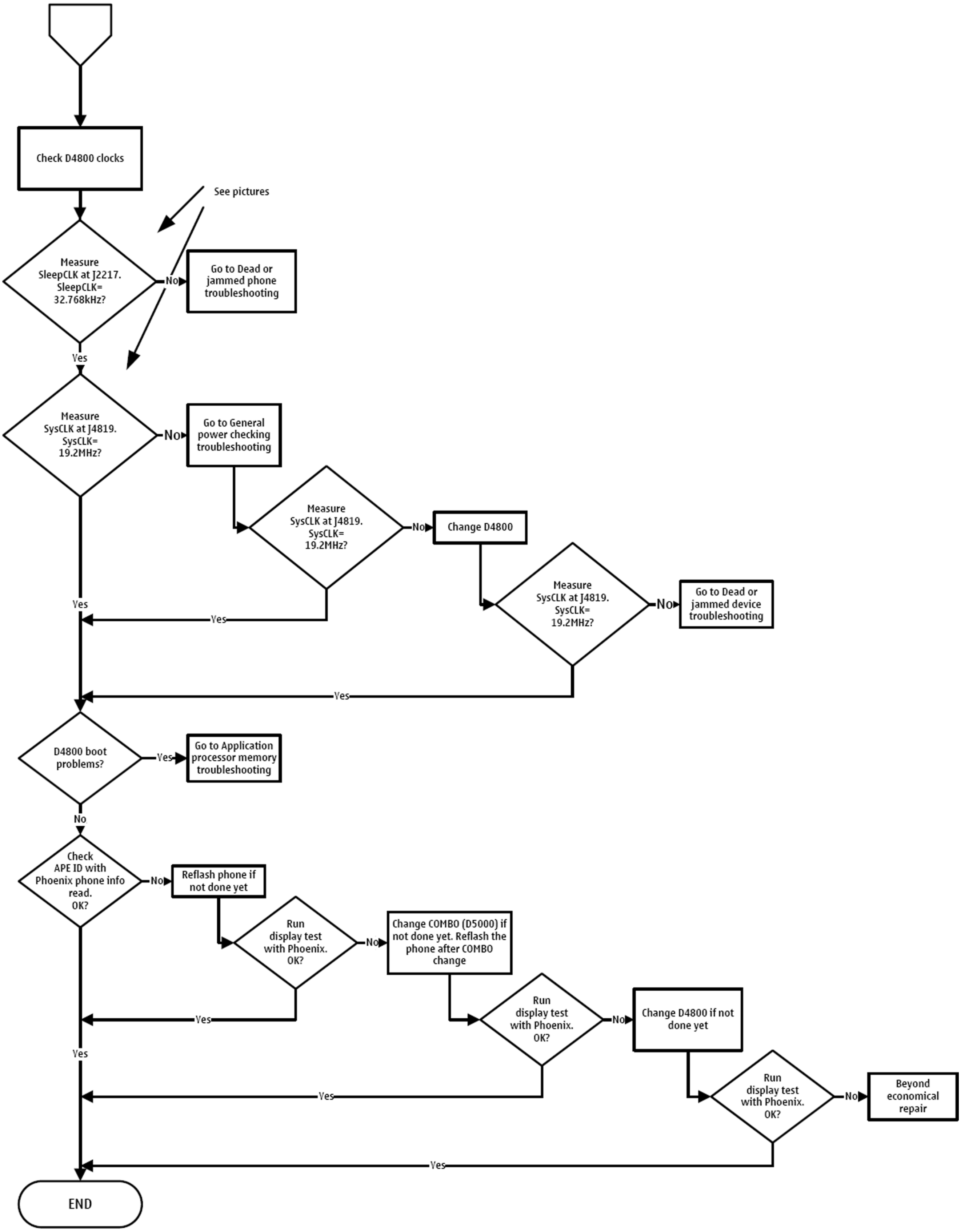
Application processor troubleshooting

Context

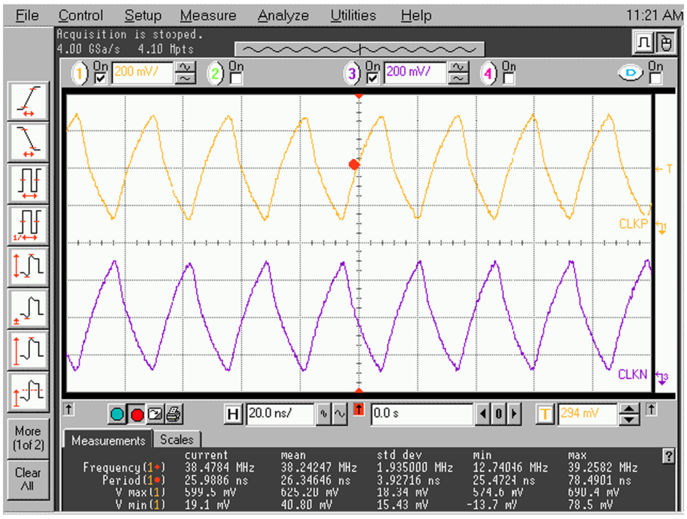
Note: If the Application processor (D4800) is faulty, it is not feasible to replace. Any reference in this troubleshooting flow to replace D4800 means that the device is not repairable.

Troubleshooting flow


Application processor troubleshooting
Can the CMT side be accessed with Phoenix?
No
Go to General power checking troubleshooting
Yes
Check APEID in Phoenix with phone information read. OK?
Yes
Change COMBO (D5000) if not done yet. Reflash the phone after COMBO change
Run display test with Phoenix (or other application processor test). OK?
Yes
No
Change D4800 if not done yet
Run display test with Phoenix (or other application processor test). OK?
Yes
Problem solved?
Yes
END
No
Go to a detailed troubleshooting page
No
Check D4800 powers
Measure VCOREA at C4800, C4801. VCOREA= 1.4V?
No
Check and replace / change R4800, C4800, C4801, C4802, C4803, C4804, C4805, C4806 & C4807
Measure VCOREA at C4800, C4801, VCOREA= 1.4V?
No
Go to General power checking troubleshooting
Yes
Yes
Measure VIO at C4808 VIO=1.8V?
No
Check and replace / change C4808, C4809, C4810, C4811 & C4812
Measure VIO at C4808 VIO=1.8V?
No
Go to General power checking troubleshooting
Yes
Yes


Check D4800 clocks
See pictures
Measure SleepCLK at J2217. SleepCLK= 32.768kHz?
No
Go to Dead or jammed phone troubleshooting
Yes
Measure SysCLK at J4819. SysCLK= 19.2MHz?
No
Go to General power checking troubleshooting
Measure SysCLK at J4819. SysCLK= 19.2MHz?
No
Change D4800
Measure SysCLK at J4819. SysCLK= 19.2MHz?
No
Go to Dead or jammed device troubleshooting
Yes
Yes
Yes
D4800 boot problems?
Yes
Go to Application processor memory troubleshooting
No
Check APE ID with Phoenix phone info read. OK?
No
Reflash phone if not done yet
Run display test with Phoenix. OK?
No
Change COMBO (D5000) if not done yet. Reflash the phone after COMBO change
Run display test with Phoenix. OK?
No
Change D4800 if not done yet
Run display test with Phoenix. OK?
No
Beyond economical repair
Yes
Yes
Yes
Yes
END

Saved: 15 JUN 2004 11:21:49


File
Control
Setup
Measure
Analyze
Utilities
Help
11:21 AM
1 On 200 mV/
2 On
3 On 200 mV/
4 On
CLKP
CLKN
More (1of 2)
Clear All
H 20.0 ns/
0.0 s
T 294 mV
Measurements
Scales

```
Acquisition is stopped.
4.00 GSa/s   4.10 Mpts
```

```
                current        mean           std dev        min            max
Frequency(1)    38.4784 MHz    38.24247 MHz   1.935000 MHz   12.74046 MHz   39.2582 MHz
   Period(1)    25.9886 ns     26.34646 ns    3.92716 ns     25.4724 ns     78.4901 ns
    V max(1)    599.5 mV       625.20 mV      18.34 mV       574.6 mV       690.4 mV
    V min(1)    19.1 mV        40.80 mV       15.43 mV       -13.7 mV       78.5 mV
```

Figure 38 SysCLK from J2800 and J2801

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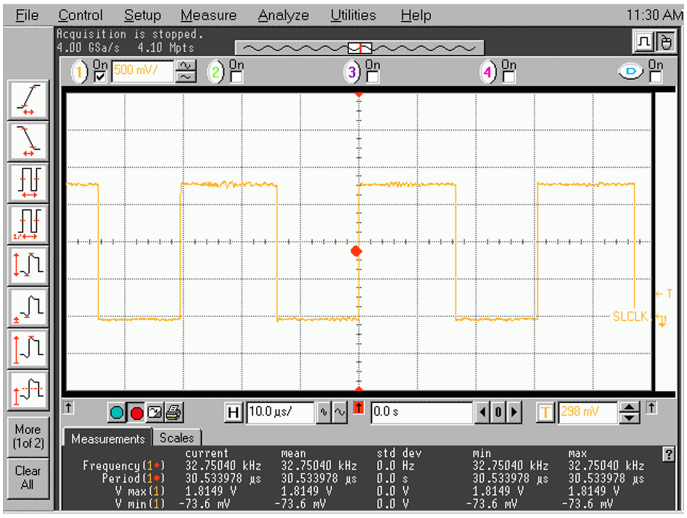

File
Control
Setup
Measure
Analyze
Utilities
Help
11:30 AM
1 On 500 mV/
2 On
3 On
4 On
SLCLK
More (1of 2)
Clear All
H 10.0 µs/
0.0 s
T 298 mV
Measurements
Scales

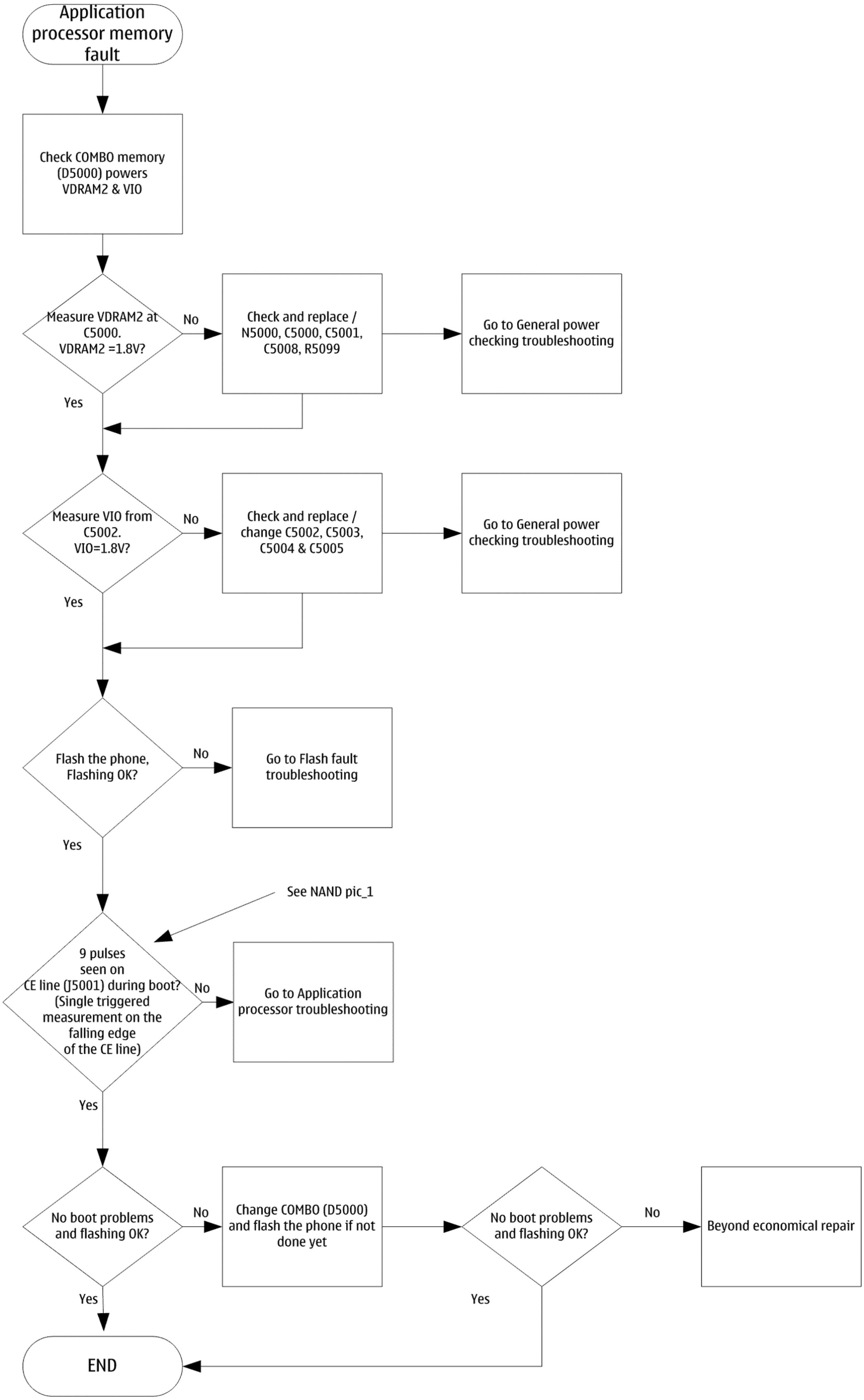
```
Acquisition is stopped.
4.00 GSa/s   4.10 Mpts
```

```
                current        mean           std dev        min            max
Frequency(1)    32.75040 kHz   32.75040 kHz   0.0 Hz         32.75040 kHz   32.75040 kHz
   Period(1)    30.533978 µs   30.533978 µs   0.0 s          30.533978 µs   30.533978 µs
    V max(1)    1.8149 V       1.8149 V       0.0 V          1.8149 V       1.8149 V
    V min(1)   -73.6 mV       -73.6 mV        0.0 V         -73.6 mV       -73.6 mV
```

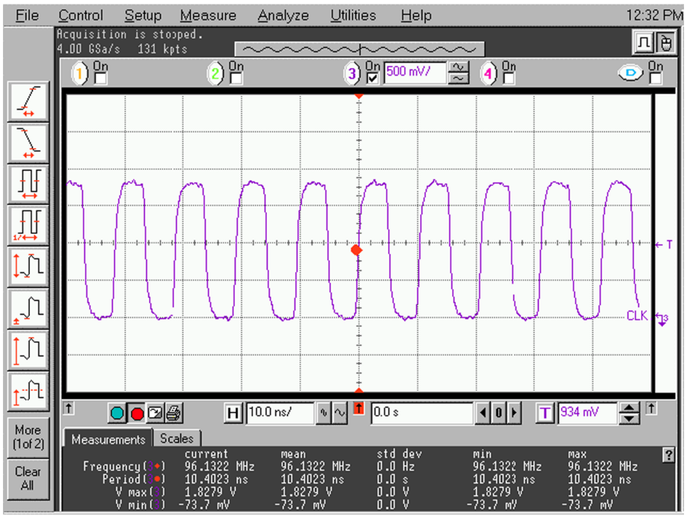
Figure 39 SleepCLK from J2217

Application processor memory troubleshooting

Troubleshooting flow


Application processor memory fault
Check COMBO memory (D5000) powers VDRAM2 & VIO
Measure VDRAM2 at C5000. VDRAM2 =1.8V?
No
Check and replace / N5000, C5000, C5001, C5008, R5099
Go to General power checking troubleshooting
Yes
Measure VIO from C5002. VIO=1.8V?
No
Check and replace / change C5002, C5003, C5004 & C5005
Go to General power checking troubleshooting
Yes
Flash the phone, Flashing OK?
No
Go to Flash fault troubleshooting
Yes
See NAND pic_1
9 pulses seen on CE line (J5001) during boot? (Single triggered measurement on the falling edge of the CE line)
No
Go to Application processor troubleshooting
Yes
No boot problems and flashing OK?
No
Change COMBO (D5000) and flash the phone if not done yet
No boot problems and flashing OK?
No
Beyond economical repair
Yes
Yes
END

Saved: 15 JUN 2004 12:32:26


File
Control
Setup
Measure
Analyze
Utilities
Help
12:32 PM
1 On
2 On
3 On
500 mV/
4 On
D On
T
CLK
More (1of 2)
Clear All
H
10.0 ns/
0.0 s
0
T
934 mV
Measurements
Scales

```
Acquisition is stopped.
4.00 GSa/s   131 kpts
```

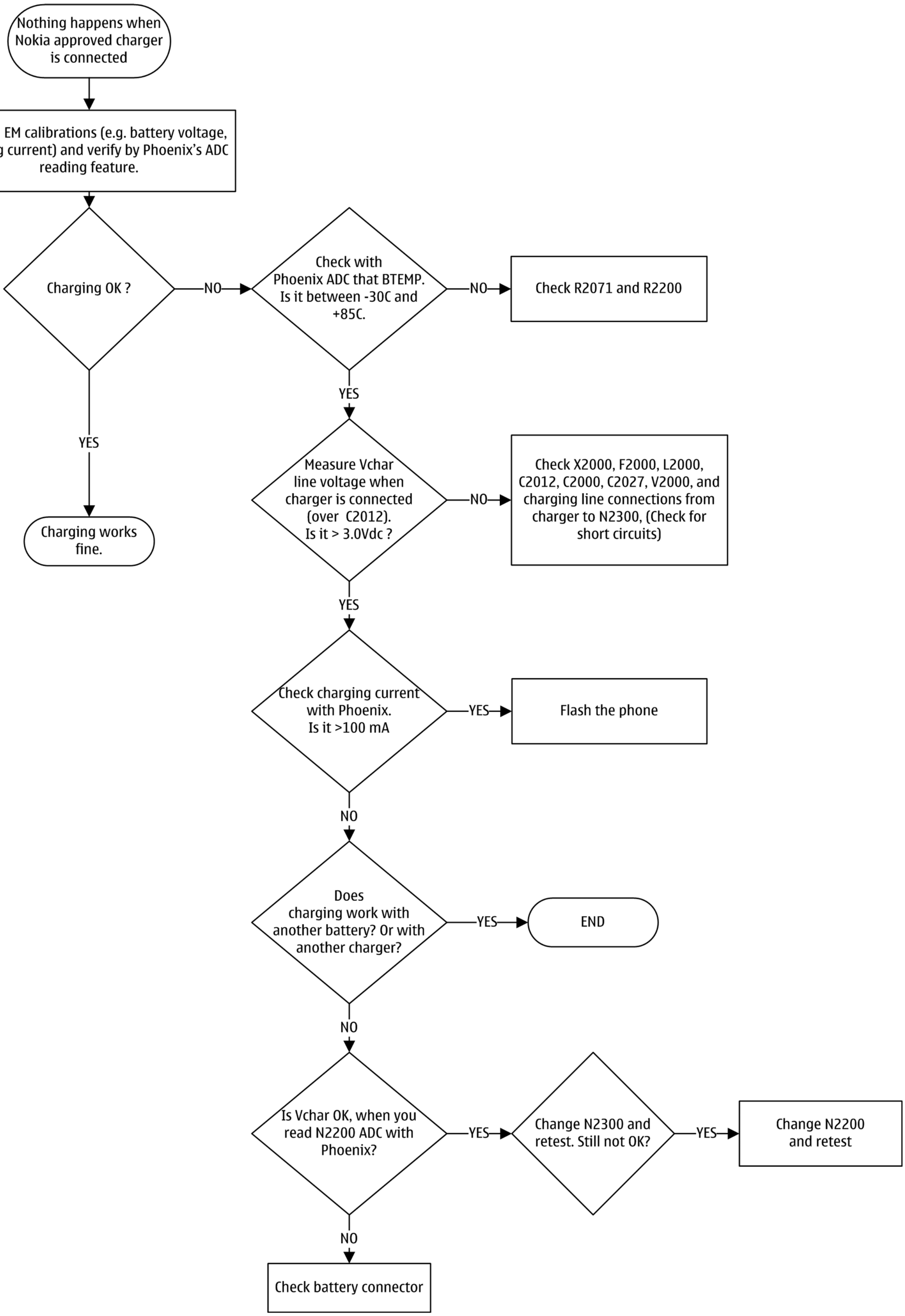
```
              current       mean          std dev    min           max
Frequency(3)  96.1322 MHz   96.1322 MHz   0.0 Hz     96.1322 MHz   96.1322 MHz
   Period(3)  10.4023 ns    10.4023 ns    0.0 s      10.4023 ns    10.4023 ns
    V max(3)  1.8279 V      1.8279 V      0.0 V      1.8279 V      1.8279 V
    V min(3) -73.7 mV      -73.7 mV       0.0 V     -73.7 mV      -73.7 mV
```

Take single trig measurement on the falling edge of the CE signal.

Figure 40 COMBO NAND in boot pic 1.

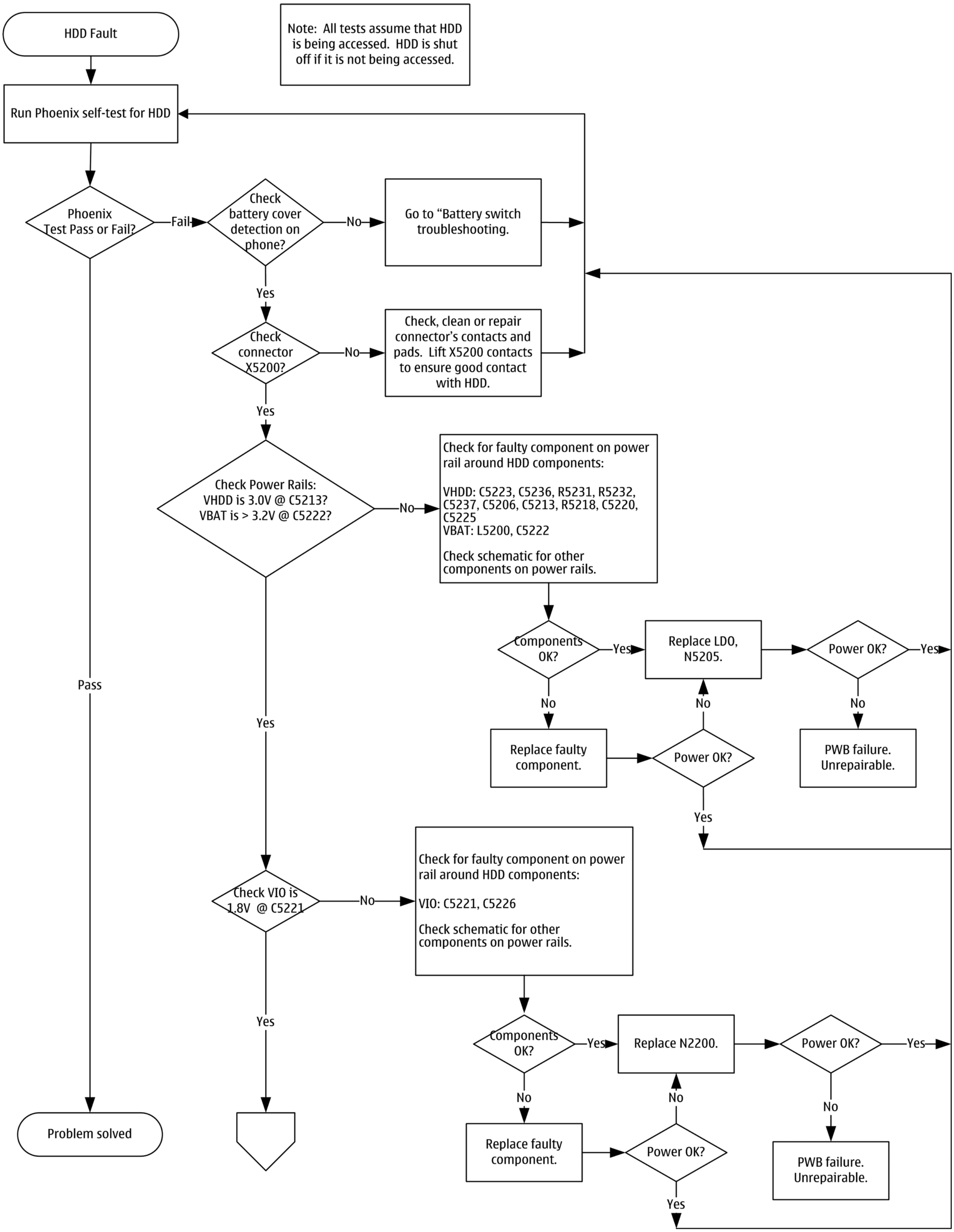
Charging troubleshooting

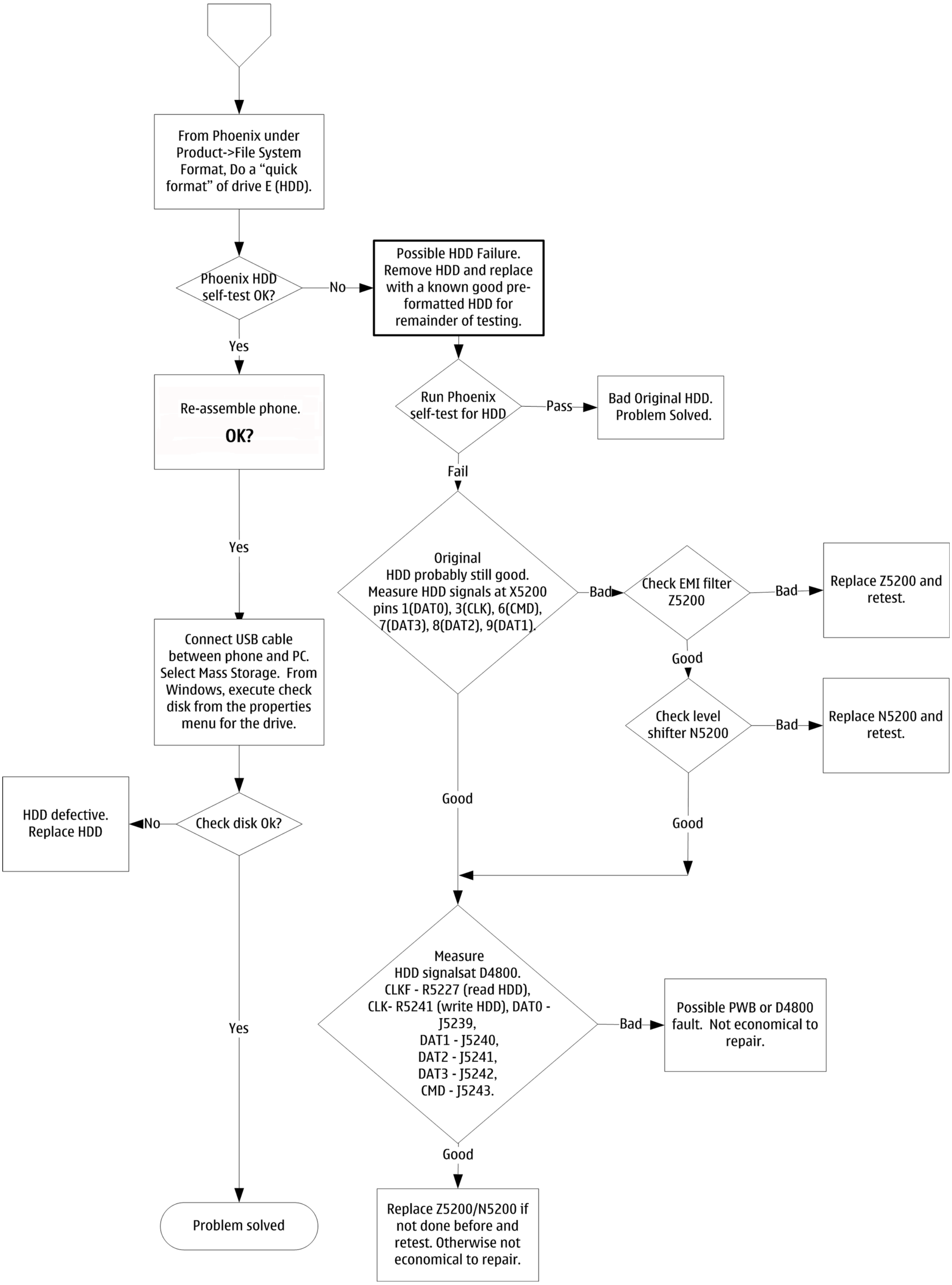
Troubleshooting flow


Nothing happens when Nokia approved charger is connected
Perform EM calibrations (e.g. battery voltage, charging current) and verify by Phoenix's ADC reading feature.
Charging OK ?
NO
YES
Charging works fine.
Check with Phoenix ADC that BTEMP. Is it between -30C and +85C.
NO
Check R2071 and R2200
YES
Measure Vchar line voltage when charger is connected (over C2012). Is it > 3.0Vdc ?
NO
Check X2000, F2000, L2000, C2012, C2000, C2027, V2000, and charging line connections from charger to N2300, (Check for short circuits)
YES
Check charging current with Phoenix. Is it >100 mA
YES
Flash the phone
NO
Does charging work with another battery? Or with another charger?
YES
END
NO
Is Vchar OK, when you read N2200 ADC with Phoenix?
YES
Change N2300 and retest. Still not OK?
YES
Change N2200 and retest
NO
Check battery connector

Hard disk drive troubleshooting

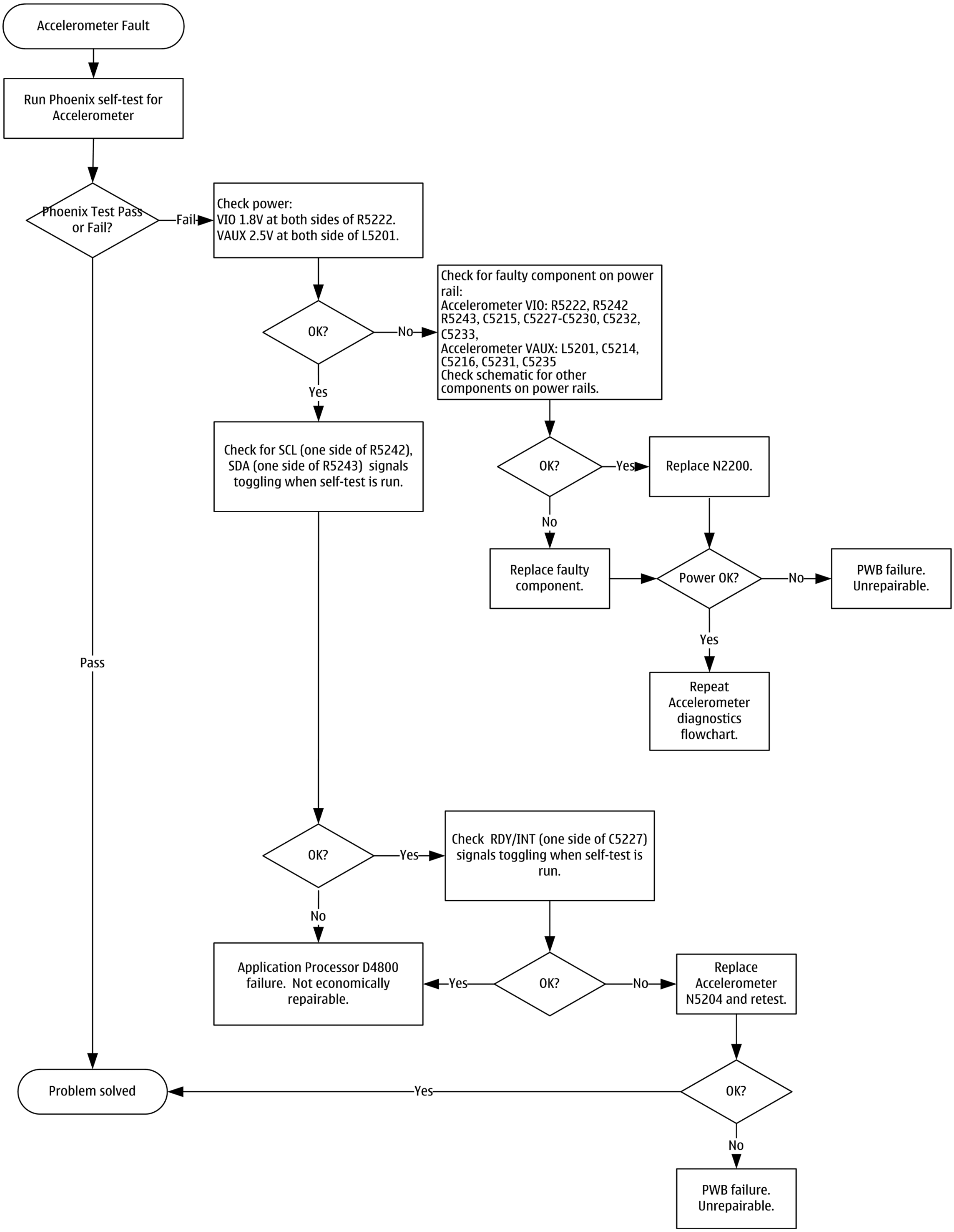
Troubleshooting flow


HDD Fault
Note: All tests assume that HDD is being accessed. HDD is shut off if it is not being accessed.
Run Phoenix self-test for HDD
Phoenix Test Pass or Fail?
Fail
Check battery cover detection on phone?
No
Go to "Battery switch troubleshooting.
Yes
Check connector X5200?
No
Check, clean or repair connector's contacts and pads. Lift X5200 contacts to ensure good contact with HDD.
Yes
Check Power Rails: VHDD is 3.0V @ C5213? VBAT is > 3.2V @ C5222?
No
Check for faulty component on power rail around HDD components:
VHDD: C5223, C5236, R5231, R5232, C5237, C5206, C5213, R5218, C5220, C5225
VBAT: L5200, C5222
Check schematic for other components on power rails.
Components OK?
Yes
Replace LDO, N5205.
Power OK?
Yes
No
No
No
Replace faulty component.
Power OK?
PWB failure. Unrepairable.
Yes
Pass
Yes
Check VIO is 1.8V @ C5221
No
Check for faulty component on power rail around HDD components:
VIO: C5221, C5226
Check schematic for other components on power rails.
Yes
Components OK?
Yes
Replace N2200.
Power OK?
Yes
No
No
No
Replace faulty component.
Power OK?
PWB failure. Unrepairable.
Yes
Problem solved


From Phoenix under Product->File System Format, Do a “quick format” of drive E (HDD).
Phoenix HDD self-test OK?
No
Possible HDD Failure. Remove HDD and replace with a known good pre-formatted HDD for remainder of testing.
Yes
Re-assemble phone.
OK?
Run Phoenix self-test for HDD
Pass
Bad Original HDD. Problem Solved.
Fail
Yes
Original HDD probably still good. Measure HDD signals at X5200 pins 1(DAT0), 3(CLK), 6(CMD), 7(DAT3), 8(DAT2), 9(DAT1).
Bad
Check EMI filter Z5200
Bad
Replace Z5200 and retest.
Good
Connect USB cable between phone and PC. Select Mass Storage. From Windows, execute check disk from the properties menu for the drive.
Check level shifter N5200
Bad
Replace N5200 and retest.
HDD defective. Replace HDD
No
Check disk Ok?
Good
Good
Measure HDD signalsat D4800. CLKF - R5227 (read HDD), CLK- R5241 (write HDD), DAT0 - J5239, DAT1 - J5240, DAT2 - J5241, DAT3 - J5242, CMD - J5243.
Bad
Possible PWB or D4800 fault. Not economical to repair.
Yes
Good
Problem solved
Replace Z5200/N5200 if not done before and retest. Otherwise not economical to repair.

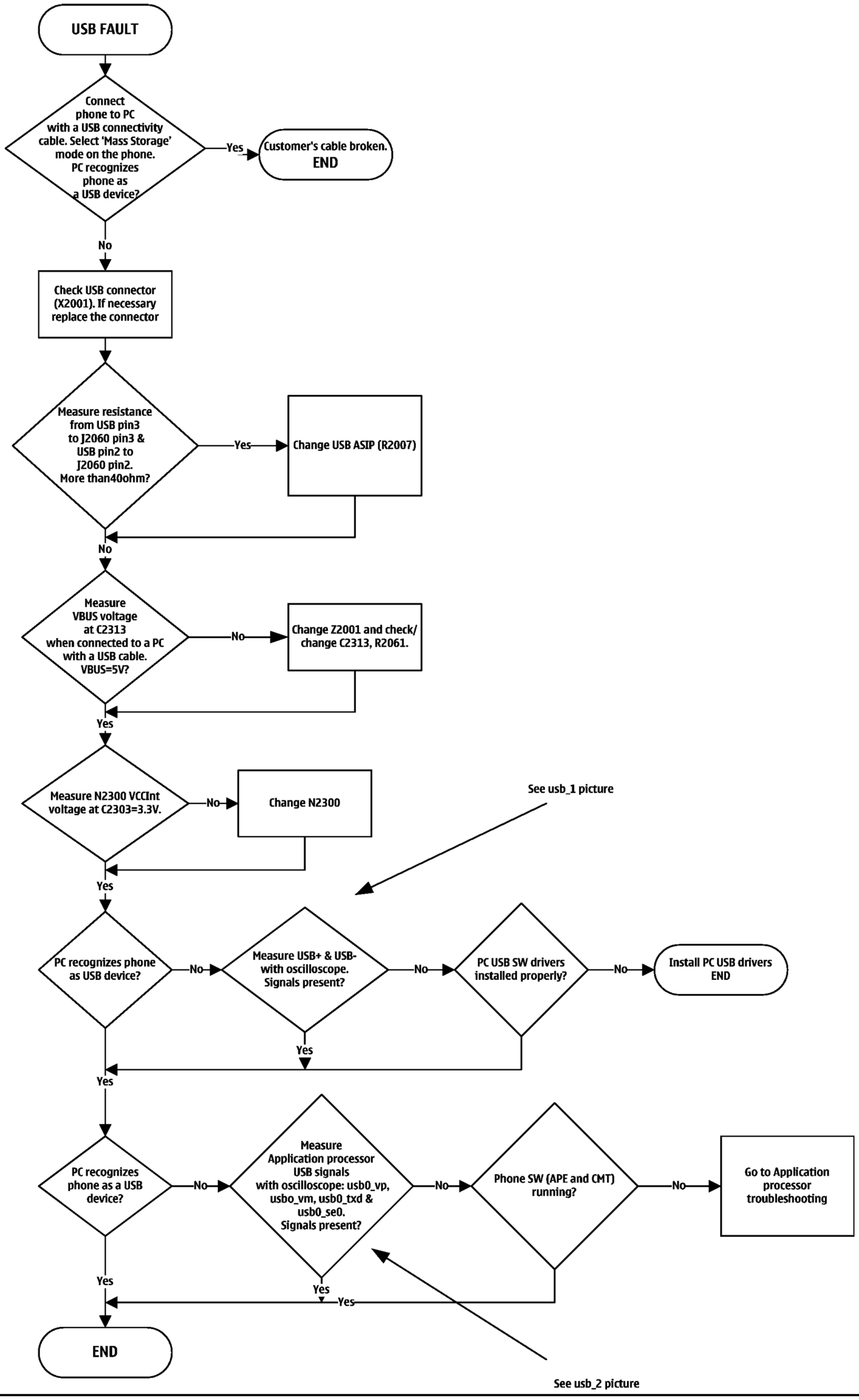
Accelerometer troubleshooting

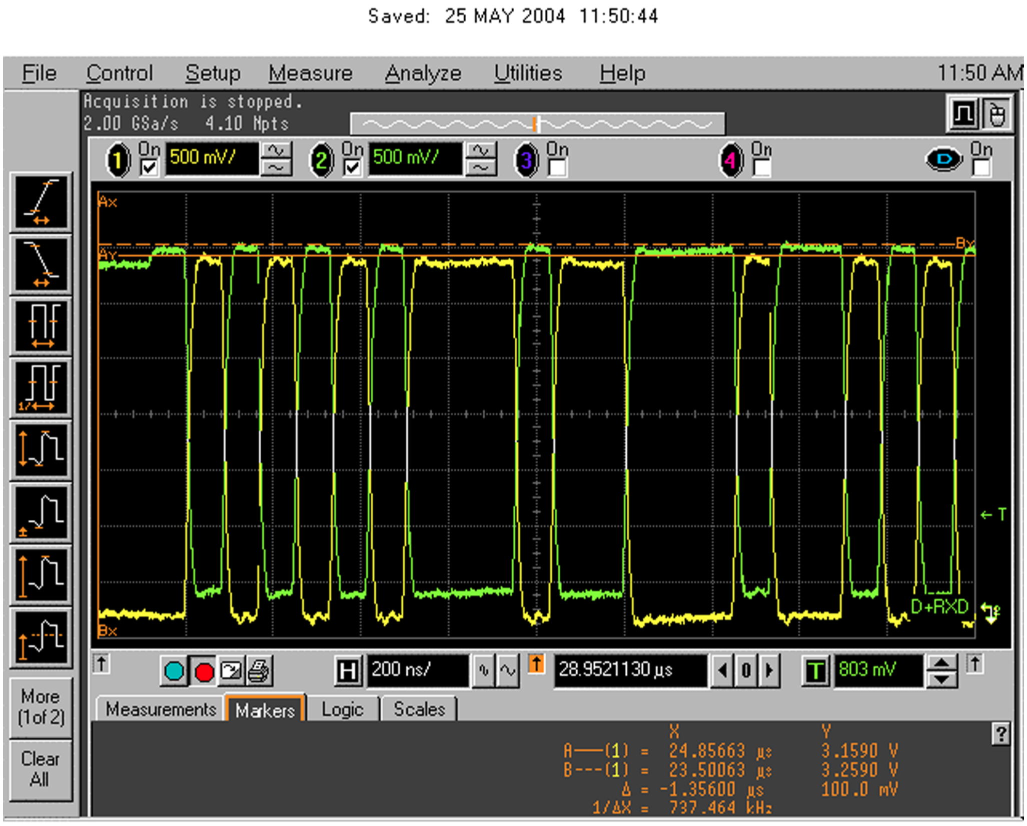
Troubleshooting flow


Accelerometer Fault
Run Phoenix self-test for Accelerometer
Phoenix Test Pass or Fail?
Fail
Check power:
VIO 1.8V at both sides of R5222.
VAUX 2.5V at both side of L5201.
OK?
No
Check for faulty component on power rail:
Accelerometer VIO: R5222, R5242 R5243, C5215, C5227-C5230, C5232, C5233,
Accelerometer VAUX: L5201, C5214, C5216, C5231, C5235
Check schematic for other components on power rails.
Yes
Check for SCL (one side of R5242), SDA (one side of R5243) signals toggling when self-test is run.
OK?
Yes
Replace N2200.
No
Replace faulty component.
Power OK?
No
PWB failure. Unrepairable.
Yes
Repeat Accelerometer diagnostics flowchart.
Pass
OK?
Yes
Check RDY/INT (one side of C5227) signals toggling when self-test is run.
No
Application Processor D4800 failure. Not economically repairable.
Yes
OK?
No
Replace Accelerometer N5204 and retest.
Problem solved
Yes
OK?
No
PWB failure. Unrepairable.

USB troubleshooting

Troubleshooting flow


USB FAULT
Connect phone to PC with a USB connectivity cable. Select 'Mass Storage' mode on the phone. PC recognizes phone as a USB device?
Yes
Customer's cable broken. END
No
Check USB connector (X2001). If necessary replace the connector
Measure resistance from USB pin3 to J2060 pin3 & USB pin2 to J2060 pin2. More than40ohm?
Yes
Change USB ASIP (R2007)
No
Measure VBUS voltage at C2313 when connected to a PC with a USB cable. VBUS=5V?
No
Change Z2001 and check/ change C2313, R2061.
Yes
Measure N2300 VCCInt voltage at C2303=3.3V.
No
Change N2300
Yes
See usb_1 picture
PC recognizes phone as USB device?
No
Measure USB+ & USB- with oscilloscope. Signals present?
No
PC USB SW drivers installed properly?
No
Install PC USB drivers END
Yes
Yes
PC recognizes phone as a USB device?
No
Measure Application processor USB signals with oscilloscope: usb0_vp, usbo_vm, usb0_txd & usb0_se0. Signals present?
No
Phone SW (APE and CMT) running?
No
Go to Application processor troubleshooting
Yes
Yes
Yes
END
See usb_2 picture



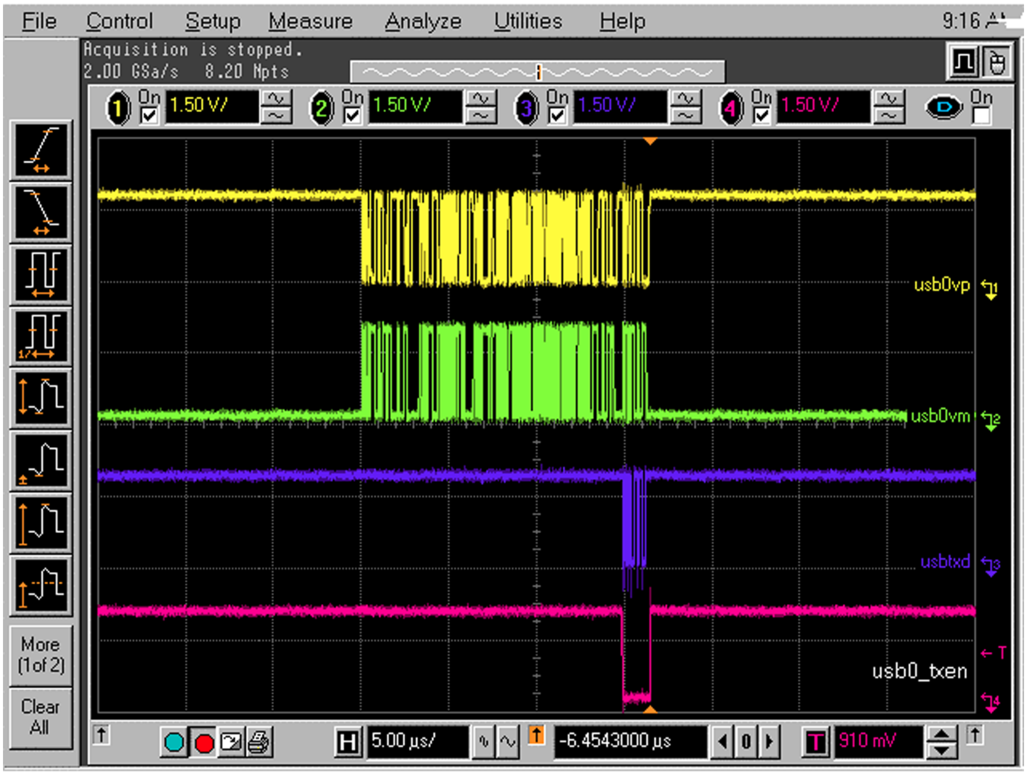
```
Saved:  25 MAY 2004  11:50:44
Acquisition is stopped.
2.00 GSa/s    4.10 Mpts
```

```
                X                Y
A——(1) =  24.85663 µs     3.1590 V
B---(1) =  23.50063 µs     3.2590 V
      Δ = -1.35600 µs     100.0 mV
  1/ΔX =  737.464 kHz
```

File
Control
Setup
Measure
Analyze
Utilities
Help
11:50 AM
1 On ☑ 500 mV/
2 On ☑ 500 mV/
3 On ☐
4 On ☐
D On ☐
Ax
Ay
Bx
By
← T
D+RXD
More (1of 2)
Clear All
H 200 ns/
28.9521130 µs
0
T 803 mV
Measurements
Markers
Logic
Scales
?

Figure 41 USB 1: D-TXD (J2063) and D+RXD (J2061) voltage levels when USB connected.

Saved: 06 JUL 2004 09:16:02



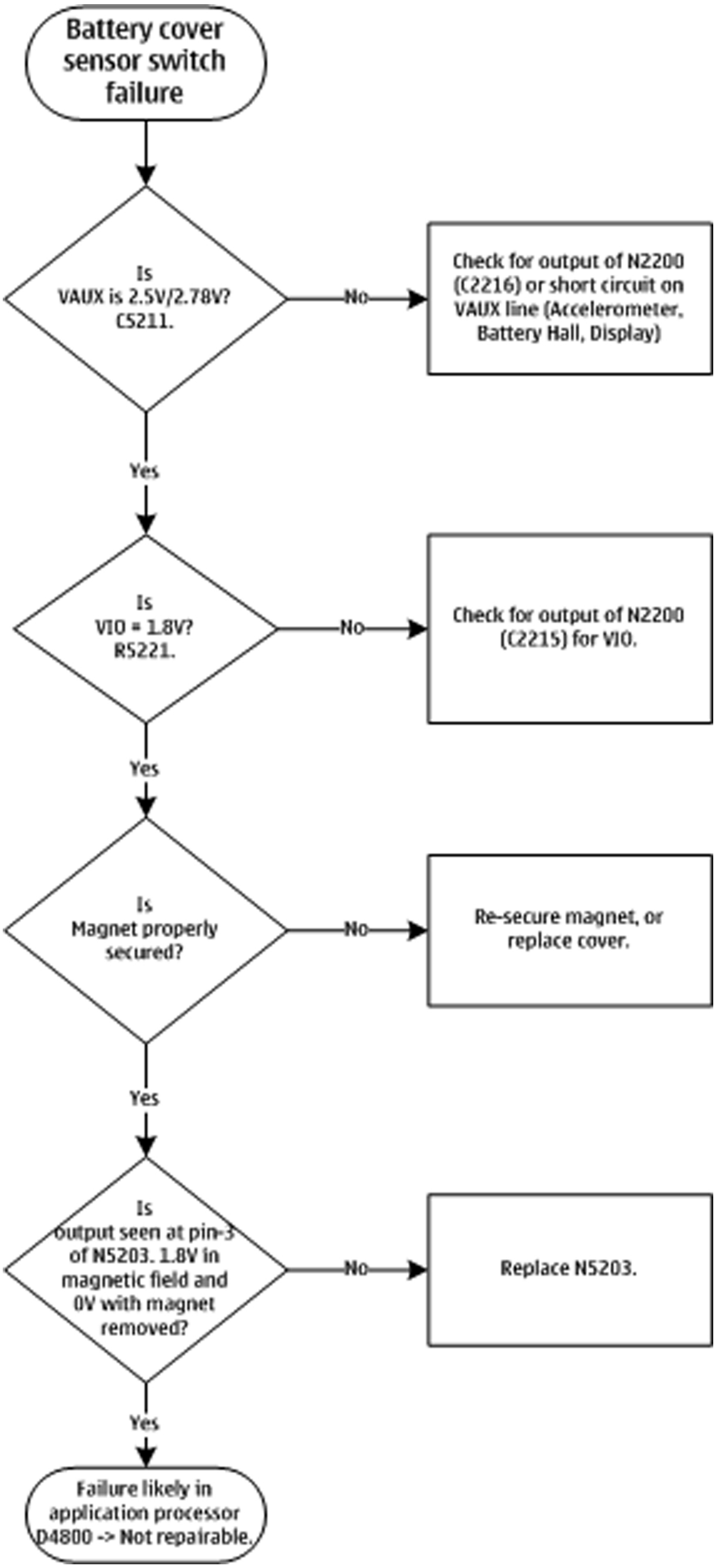
Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

File
Control
Setup
Measure
Analyze
Utilities
Help
9:16 A
1 On 1.50 V/
2 On 1.50 V/
3 On 1.50 V/
4 On 1.50 V/
On
usb0vp
usb0vm
usbtxd
usb0_txen
T
More (1of 2)
Clear All
H 5.00 µs/
-6.4543000 µs
0
T 910 mV

Figure 42 Take single triggered measurement on the rising edge of the Helen usb0_txen line J4813

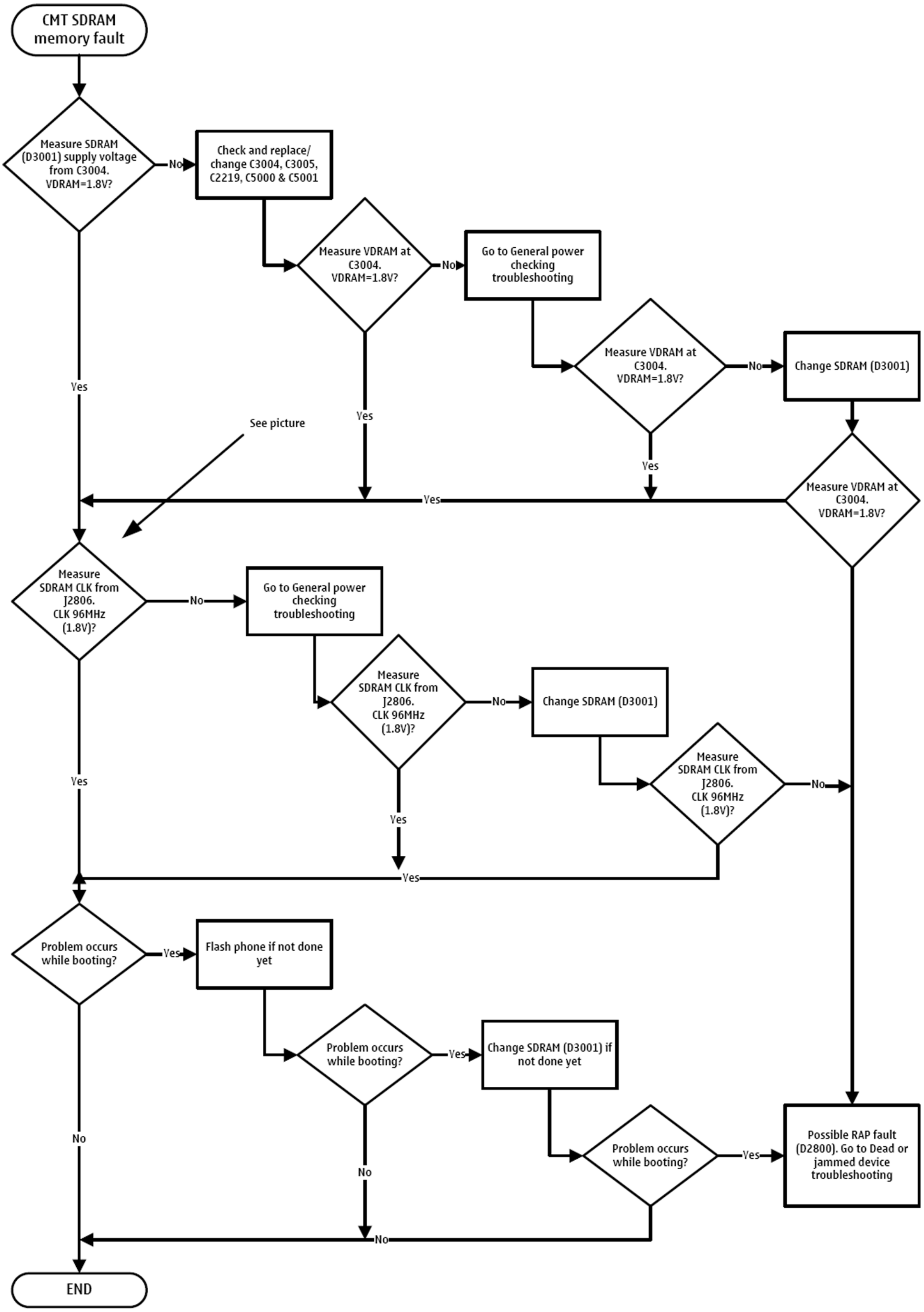
Battery cover sensor switch troubleshooting

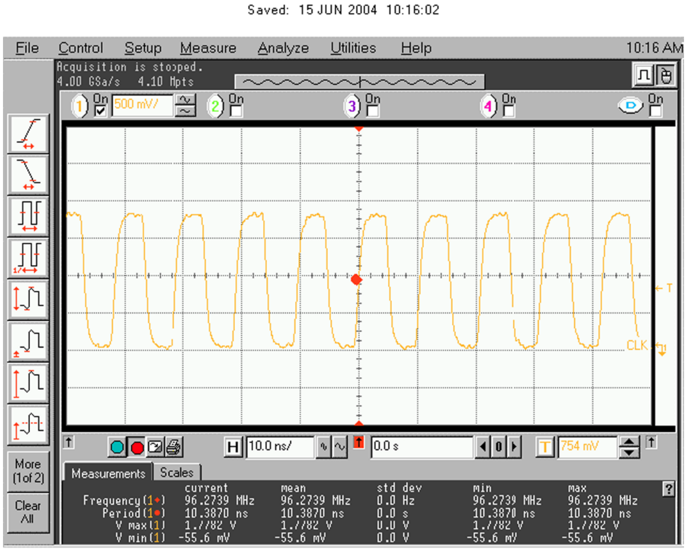
Troubleshooting flow


Battery cover sensor switch failure
Is VAUX is 2.5V/2.78V? C5211.
No
Check for output of N2200 (C2216) or short circuit on VAUX line (Accelerometer, Battery Hall, Display)
Yes
Is VIO = 1.8V? R5221.
No
Check for output of N2200 (C2215) for VIO.
Yes
Is Magnet properly secured?
No
Re-secure magnet, or replace cover.
Yes
Is output seen at pin-3 of N5203. 1.8V in magnetic field and 0V with magnet removed?
No
Replace N5203.
Yes
Failure likely in application processor D4800 -> Not repairable.

CMT SDRAM memory troubleshooting

Troubleshooting flow


CMT SDRAM memory fault
Measure SDRAM (D3001) supply voltage from C3004. VDRAM=1.8V?
No
Check and replace/ change C3004, C3005, C2219, C5000 & C5001
Measure VDRAM at C3004. VDRAM=1.8V?
No
Go to General power checking troubleshooting
Measure VDRAM at C3004. VDRAM=1.8V?
No
Change SDRAM (D3001)
Measure VDRAM at C3004. VDRAM=1.8V?
Yes
Yes
Yes
Yes
See picture
Measure SDRAM CLK from J2806. CLK 96MHz (1.8V)?
No
Go to General power checking troubleshooting
Measure SDRAM CLK from J2806. CLK 96MHz (1.8V)?
No
Change SDRAM (D3001)
Measure SDRAM CLK from J2806. CLK 96MHz (1.8V)?
No
Yes
Yes
Yes
Problem occurs while booting?
Yes
Flash phone if not done yet
Problem occurs while booting?
Yes
Change SDRAM (D3001) if not done yet
Problem occurs while booting?
Yes
Possible RAP fault (D2800). Go to Dead or jammed device troubleshooting
No
No
No
END


Saved: 15 JUN 2004 10:16:02
File
Control
Setup
Measure
Analyze
Utilities
Help
10:16 AM
1
On
500 mV/
2
On
3
On
4
On
On
T
CLK
More (1of 2)
Clear All
H
10.0 ns/
0.0 s
0
T
754 mV
Measurements
Scales

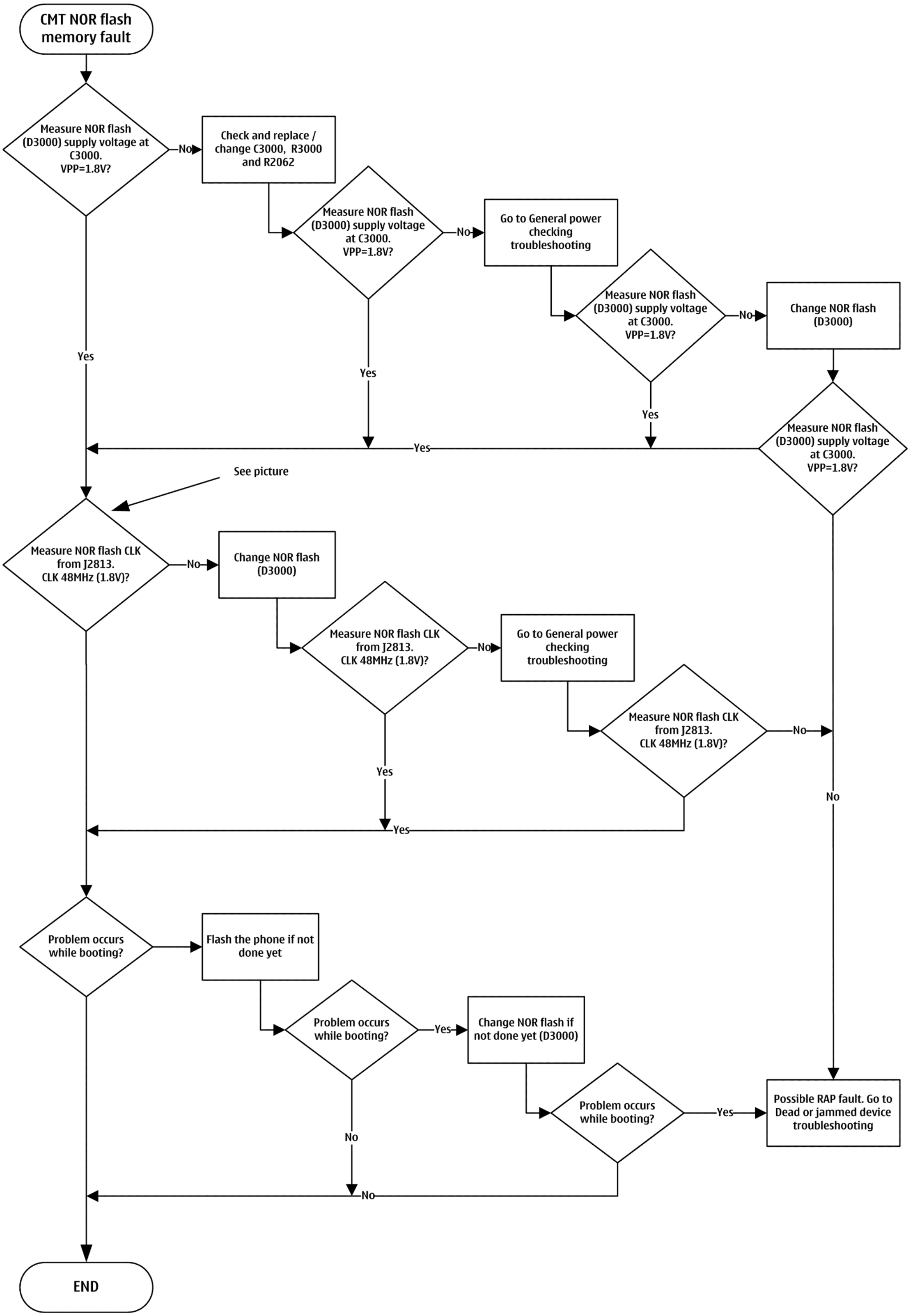
```
Acquisition is stopped.
4.00 GSa/s   4.10 Mpts
```

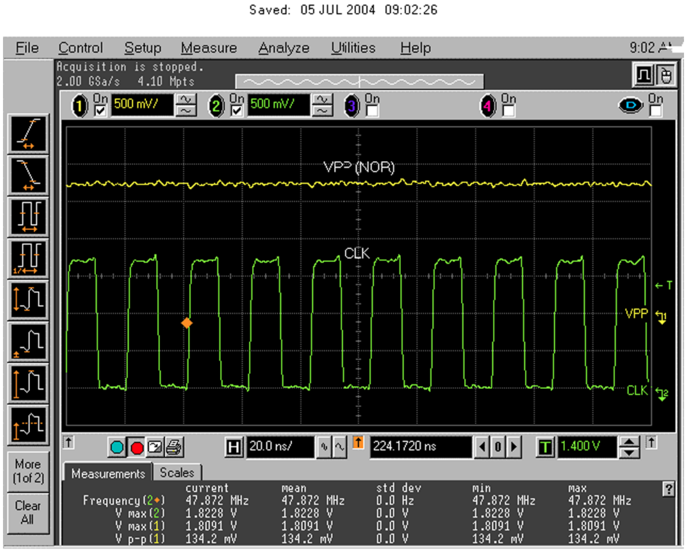
```
                  current        mean           std dev     min            max
Frequency(1)   96.2739 MHz    96.2739 MHz    0.0 Hz      96.2739 MHz    96.2739 MHz
   Period(1)   10.3870 ns     10.3870 ns     0.0 s       10.3870 ns     10.3870 ns
    V max(1)   1.7782 V       1.7782 V       0.0 V       1.7782 V       1.7782 V
    V min(1)  -55.6 mV       -55.6 mV        0.0 V      -55.6 mV       -55.6 mV
```

Figure 43 CMT SDRAM CLK from pin J2806

CMT NOR flash fault troubleshooting

Troubleshooting flow


CMT NOR flash memory fault
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
No
Check and replace / change C3000, R3000 and R2062
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
No
Go to General power checking troubleshooting
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
No
Change NOR flash (D3000)
Measure NOR flash (D3000) supply voltage at C3000. VPP=1.8V?
Yes
Yes
Yes
Yes
See picture
Measure NOR flash CLK from J2813. CLK 48MHz (1.8V)?
No
Change NOR flash (D3000)
Measure NOR flash CLK from J2813. CLK 48MHz (1.8V)?
No
Go to General power checking troubleshooting
Measure NOR flash CLK from J2813. CLK 48MHz (1.8V)?
No
No
Yes
Yes
Problem occurs while booting?
Flash the phone if not done yet
Problem occurs while booting?
Yes
Change NOR flash if not done yet (D3000)
Problem occurs while booting?
Yes
Possible RAP fault. Go to Dead or jammed device troubleshooting
No
No
END



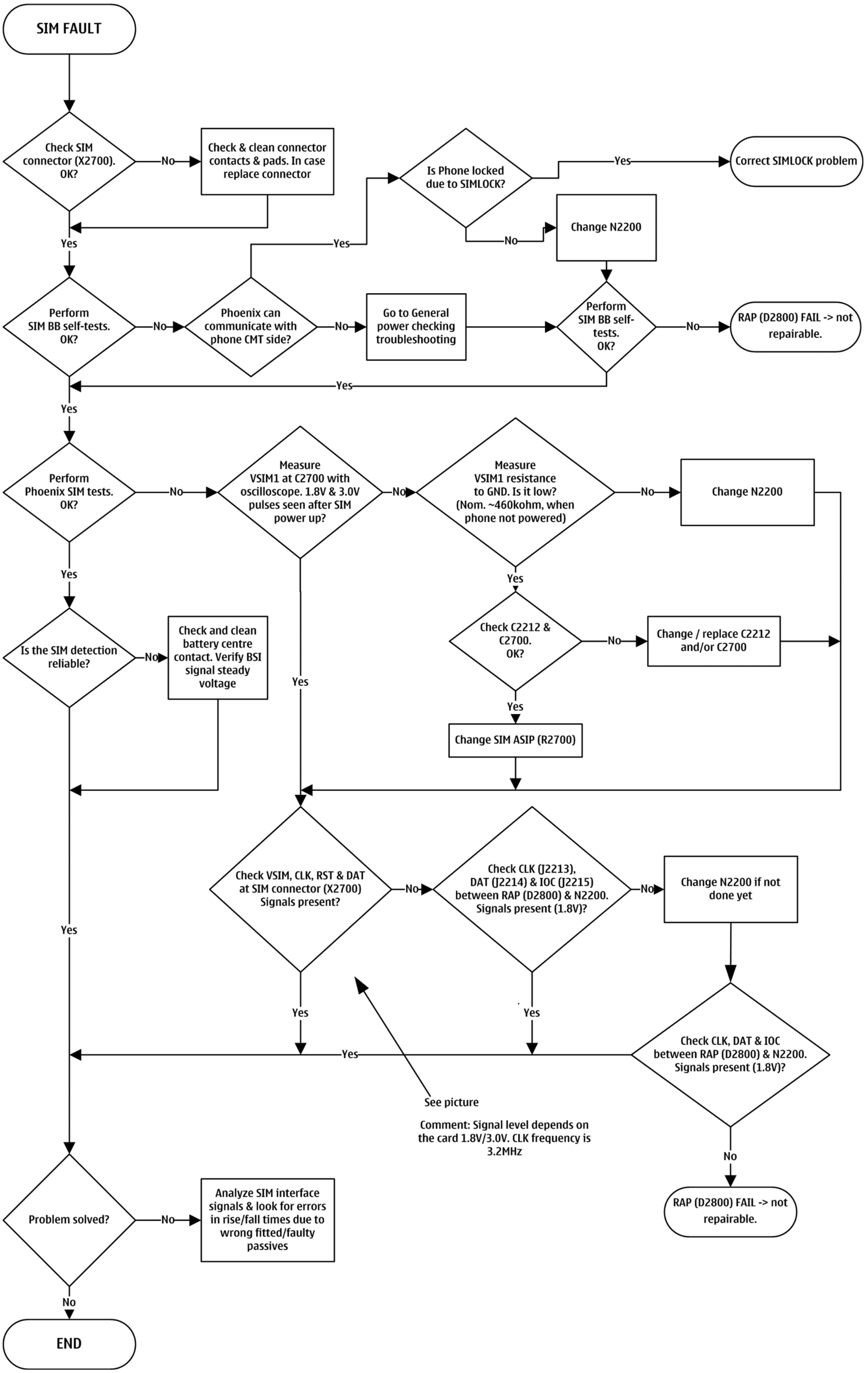
```
Saved:  05 JUL 2004  09:02:26

Acquisition is stopped.
2.00 GSa/s   4.10 Mpts

                current     mean        std dev   min         max
Frequency(2◆)   47.872 MHz  47.872 MHz  0.0 Hz    47.872 MHz  47.872 MHz
    V max(2)    1.8228 V    1.8228 V    0.0 V     1.8228 V    1.8228 V
    V max(1)    1.8091 V    1.8091 V    0.0 V     1.8091 V    1.8091 V
    V p-p(1)    134.2 mV    134.2 mV    0.0 V     134.2 mV    134.2 mV
```

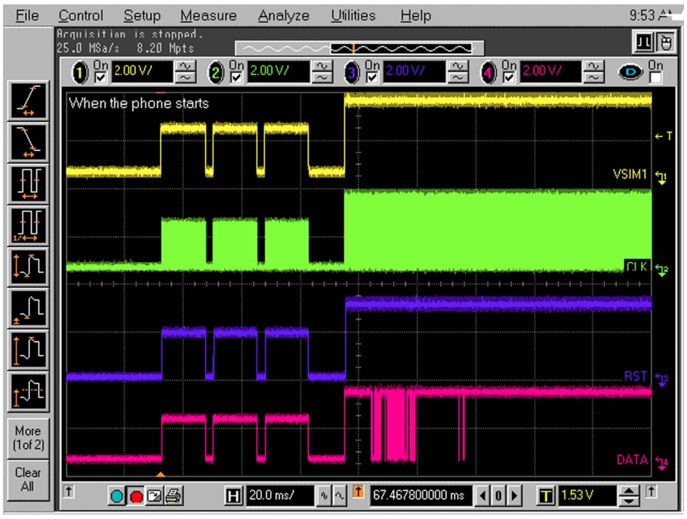
File
Control
Setup
Measure
Analyze
Utilities
Help
9:02 A
1 On ☑ 500 mV/
2 On ☑ 500 mV/
3 On ☐
4 On ☐
D On ☐
VPP (NOR)
CLK
T
VPP
CLK
H 20.0 ns/
224.1720 ns
0
T 1.400 V
More (1of 2)
Clear All
Measurements
Scales
?

Figure 44 NOR CLK from J2813

SIM card troubleshooting

Troubleshooting flow


SIM FAULT
Check SIM connector (X2700). OK?
No
Check & clean connector contacts & pads. In case replace connector
Yes
Is Phone locked due to SIMLOCK?
Yes
Correct SIMLOCK problem
No
Change N2200
Yes
Perform SIM BB self-tests. OK?
No
Phoenix can communicate with phone CMT side?
No
Go to General power checking troubleshooting
Perform SIM BB self-tests. OK?
No
RAP (D2800) FAIL -> not repairable.
Yes
Yes
Perform Phoenix SIM tests. OK?
No
Measure VSIM1 at C2700 with oscilloscope. 1.8V & 3.0V pulses seen after SIM power up?
No
Measure VSIM1 resistance to GND. Is it low? (Nom. ~460kohm, when phone not powered)
No
Change N2200
Yes
Yes
Check C2212 & C2700. OK?
No
Change / replace C2212 and/or C2700
Yes
Change SIM ASIP (R2700)
Is the SIM detection reliable?
No
Check and clean battery centre contact. Verify BSI signal steady voltage
Yes
Yes
Check VSIM, CLK, RST & DAT at SIM connector (X2700) Signals present?
No
Check CLK (J2213), DAT (J2214) & IOC (J2215) between RAP (D2800) & N2200. Signals present (1.8V)?
No
Change N2200 if not done yet
Yes
Yes
Yes
Check CLK, DAT & IOC between RAP (D2800) & N2200. Signals present (1.8V)?
See picture
Comment: Signal level depends on the card 1.8V/3.0V. CLK frequency is 3.2MHz
No
RAP (D2800) FAIL -> not repairable.
Problem solved?
No
Analyze SIM interface signals & look for errors in rise/fall times due to wrong fitted/faulty passives
No
END


File
Control
Setup
Measure
Analyze
Utilities
Help
9:53 AM
Acquisition is stopped.
25.0 MSa/s 8.20 Mpts
2.00 V/
2.00 V/
2.00 V/
2.00 V/
When the phone starts
VSIM1
CLK
RST
DATA
More (1of 2)
Clear All
20.0 ms/
67.467800000 ms
1.53 V

SIM CLK frequency = 3.2MHz (Take single triggered measurement in boot on the VSIM1 line).

Figure 45 SIM interface signals

Keyboard troubleshooting

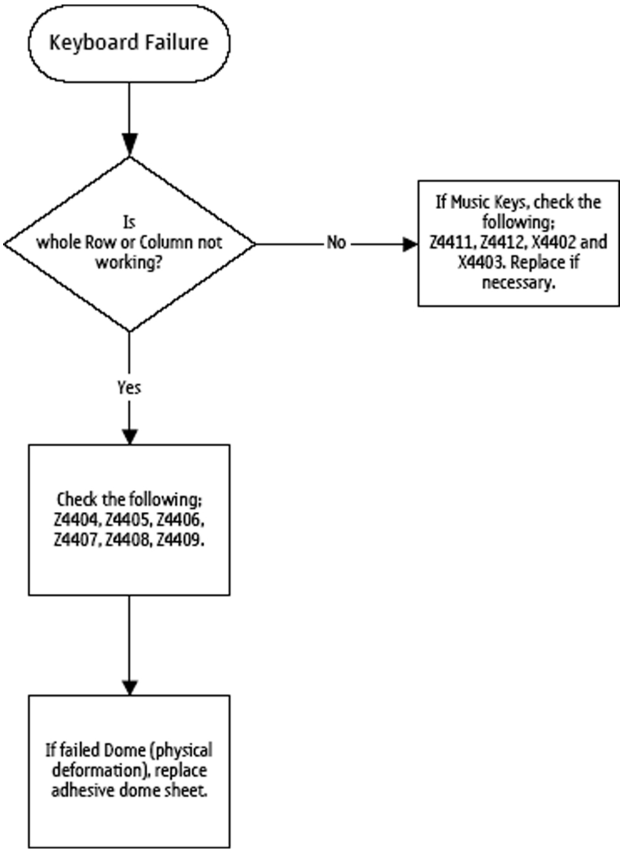
Context

There are two possible failure modes in the keyboard module:

- One or more keys are stuck, so that the key does not react when a keydome is pressed. This kind of failure is usually a result of a mechanical failure (dirt, corrosion).
- Malfunction of several keys at the same time; may happen when one or more rows or columns are faulty (short or open connection). For a more detailed description of the keyboard and keymatrix, see section "Keyboard" (page 9–20).

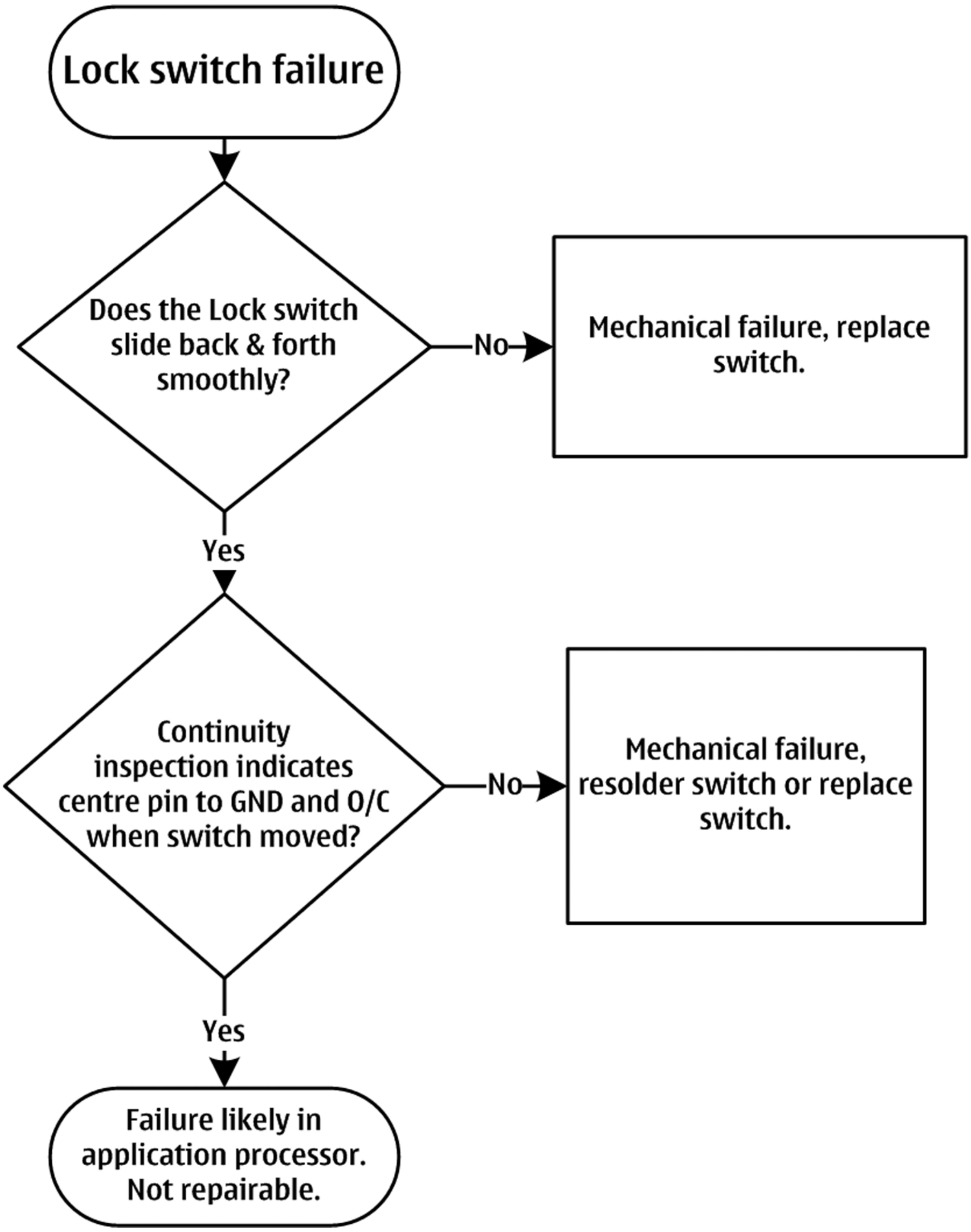
If the failure mode is not clear, start with the **Keyboard Test** using *Phoenix*.

Troubleshooting flow


Keyboard Failure
Is whole Row or Column not working?
No
If Music Keys, check the following; Z4411, Z4412, X4402 and X4403. Replace if necessary.
Yes
Check the following; Z4404, Z4405, Z4406, Z4407, Z4408, Z4409.
If failed Dome (physical deformation), replace adhesive dome sheet.

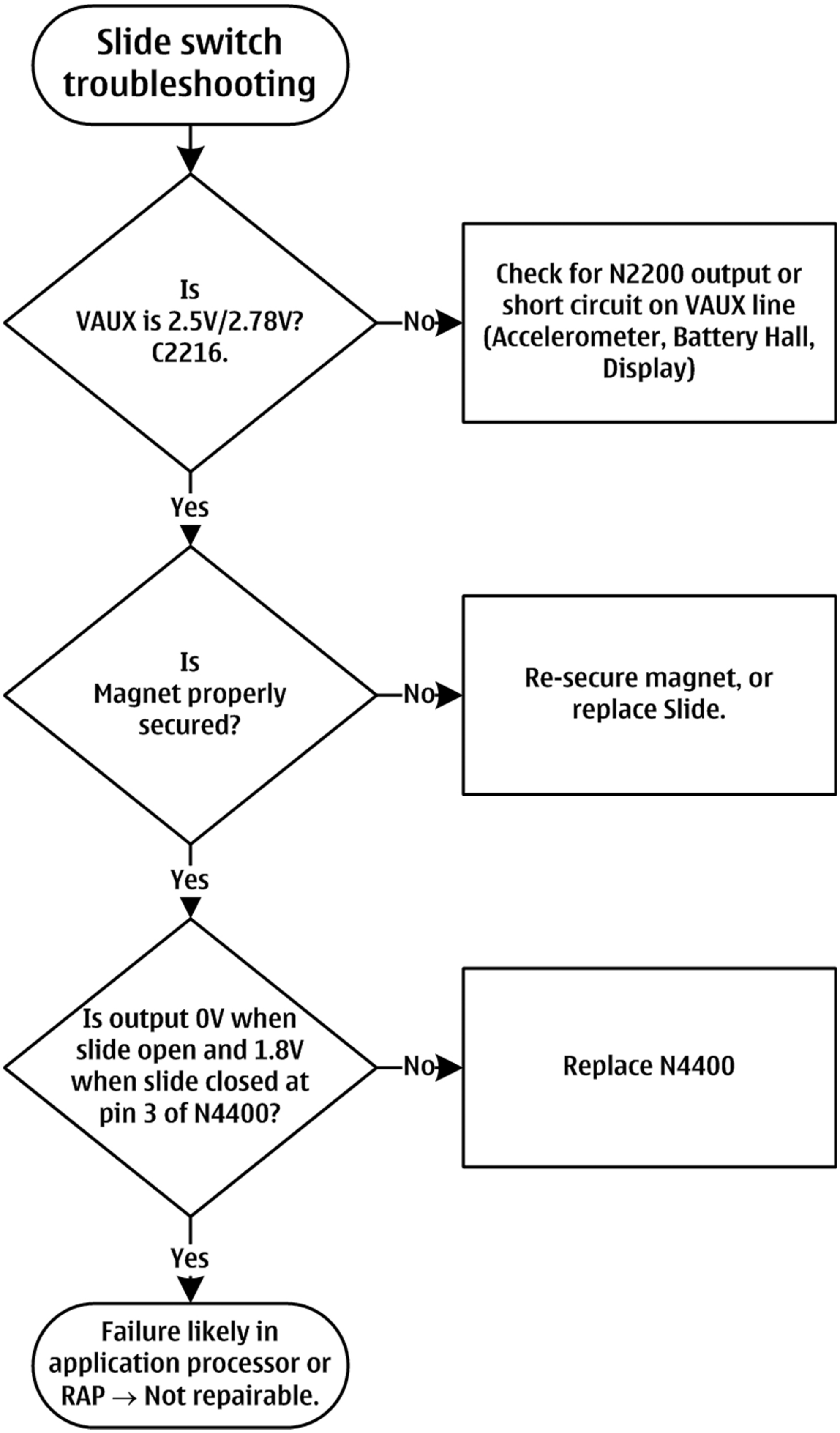
Lock switch troubleshooting

Troubleshooting flow


Lock switch failure
Does the Lock switch slide back & forth smoothly?
No
Mechanical failure, replace switch.
Yes
Continuity inspection indicates centre pin to GND and O/C when switch moved?
No
Mechanical failure, resolder switch or replace switch.
Yes
Failure likely in application processor. Not repairable.

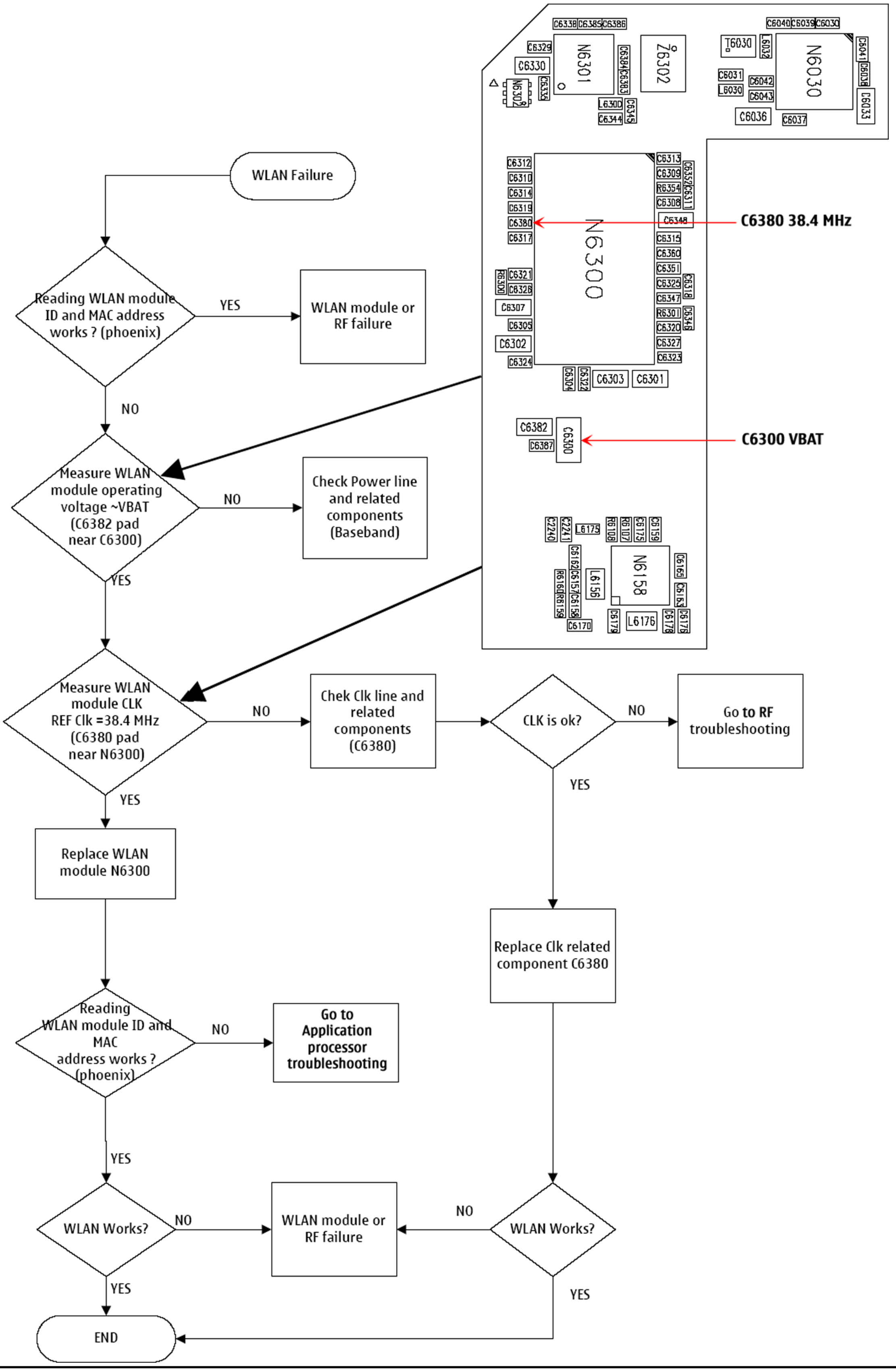
Slide switch troubleshooting

Troubleshooting flow


Slide switch troubleshooting
Is VAUX is 2.5V/2.78V? C2216.
No
Check for N2200 output or short circuit on VAUX line (Accelerometer, Battery Hall, Display)
Yes
Is Magnet properly secured?
No
Re-secure magnet, or replace Slide.
Yes
Is output 0V when slide open and 1.8V when slide closed at pin 3 of N4400?
No
Replace N4400
Yes
Failure likely in application processor or RAP → Not repairable.

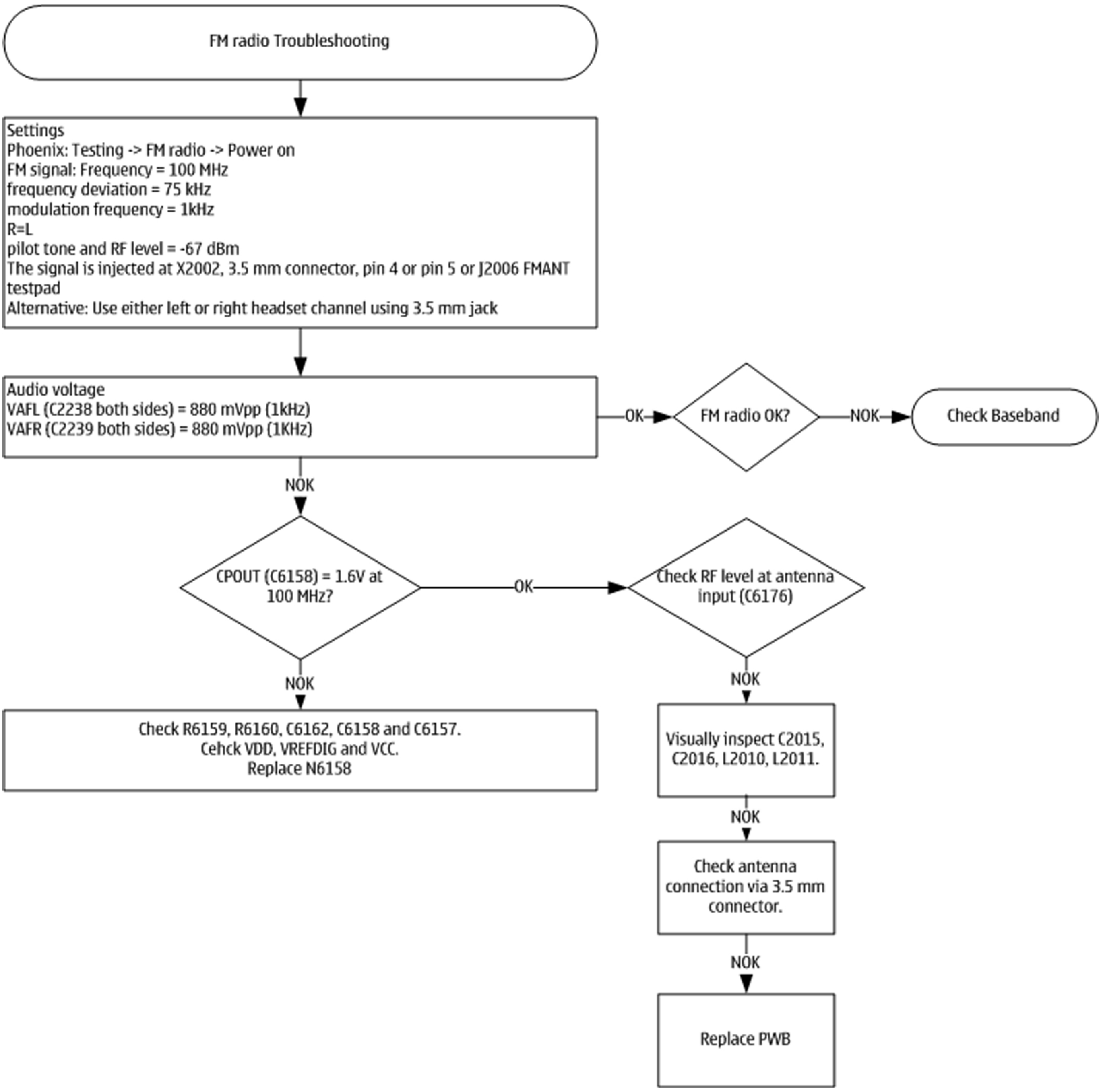
WLAN troubleshooting

Troubleshooting flow


WLAN Failure
Reading WLAN module ID and MAC address works ? (phoenix)
YES
WLAN module or RF failure
NO
Measure WLAN module operating voltage ~VBAT (C6382 pad near C6300)
NO
Check Power line and related components (Baseband)
YES
Measure WLAN module CLK REF Clk =38.4 MHz (C6380 pad near N6300)
NO
Chek Clk line and related components (C6380)
CLK is ok?
NO
Go to RF troubleshooting
YES
Replace Clk related component C6380
YES
Replace WLAN module N6300
Reading WLAN module ID and MAC address works ? (phoenix)
NO
Go to Application processor troubleshooting
YES
WLAN Works?
NO
WLAN module or RF failure
NO
WLAN Works?
YES
YES
END
C6380 38.4 MHz
C6300 VBAT
N6300
N6301
N6302
Z6302
N6030
T6030
N6158
C6380
C6382
C6300
L6175
L6176
L6156

FM radio troubleshooting

Troubleshooting flow


FM radio Troubleshooting
Settings
Phoenix: Testing -> FM radio -> Power on
FM signal: Frequency = 100 MHz
frequency deviation = 75 kHz
modulation frequency = 1kHz
R=L
pilot tone and RF level = -67 dBm
The signal is injected at X2002, 3.5 mm connector, pin 4 or pin 5 or J2006 FMANT testpad
Alternative: Use either left or right headset channel using 3.5 mm jack
Audio voltage
VAFL (C2238 both sides) = 880 mVpp (1kHz)
VAFR (C2239 both sides) = 880 mVpp (1KHz)
OK
FM radio OK?
NOK
Check Baseband
NOK
CPOUT (C6158) = 1.6V at 100 MHz?
OK
Check RF level at antenna input (C6176)
NOK
Check R6159, R6160, C6162, C6158 and C6157.
Cehck VDD, VREFDIG and VCC.
Replace N6158
NOK
Visually inspect C2015, C2016, L2010, L2011.
NOK
Check antenna connection via 3.5 mm connector.
NOK
Replace PWB

Certificate restoring for BB5.0 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-8 or FPS-10.

Note: USB flashing does not work for a dead BB5.0 phone.

- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2004.39.7.70 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5.0 testing and tuning features)
- External smart card reader

  Note: The smart card reader is only needed when FPS-8 is used. FPS-10 has an integrated smart card reader.
- Activated FPS-8 flash prommer **OR** FPS-10 flash prommer
- Flash update package 03.18.004 or newer for FPS-8 or FPS-10 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.

   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-8 or FPS-10.

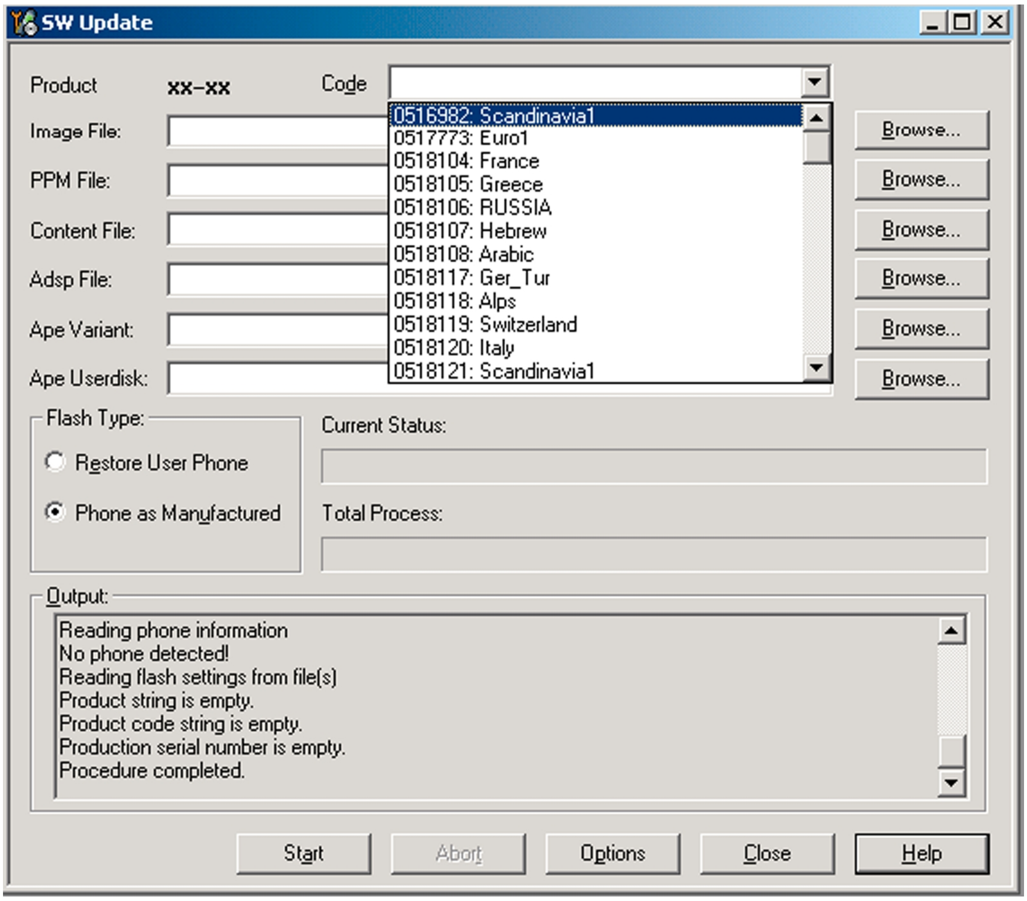
   ii Update the phone MCU software to the latest available version.

   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

   iii Choose the product manually from **File→Open Product**, and click **OK**.

   Wait for the phone type designator (e.g. “RM-1”) to be displayed in the status bar.

   iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.


SW Update
Code
0516982: Scandinavia1
0517773: Euro1
0518104: France
0518105: Greece
0518106: RUSSIA
0518107: Hebrew
0518108: Arabic
0518117: Ger_Tur
0518118: Alps
0518119: Switzerland
0518120: Italy
0518121: Scandinavia1
Image File:
PPM File:
Content File:
Adsp File:
Ape Variant:
Ape Userdisk:
Browse...
Browse...
Browse...
Browse...
Browse...
Browse...
Current Status:
Total Process:
Output:
Start
Abort
Options
Close
Help

Product xx-xx

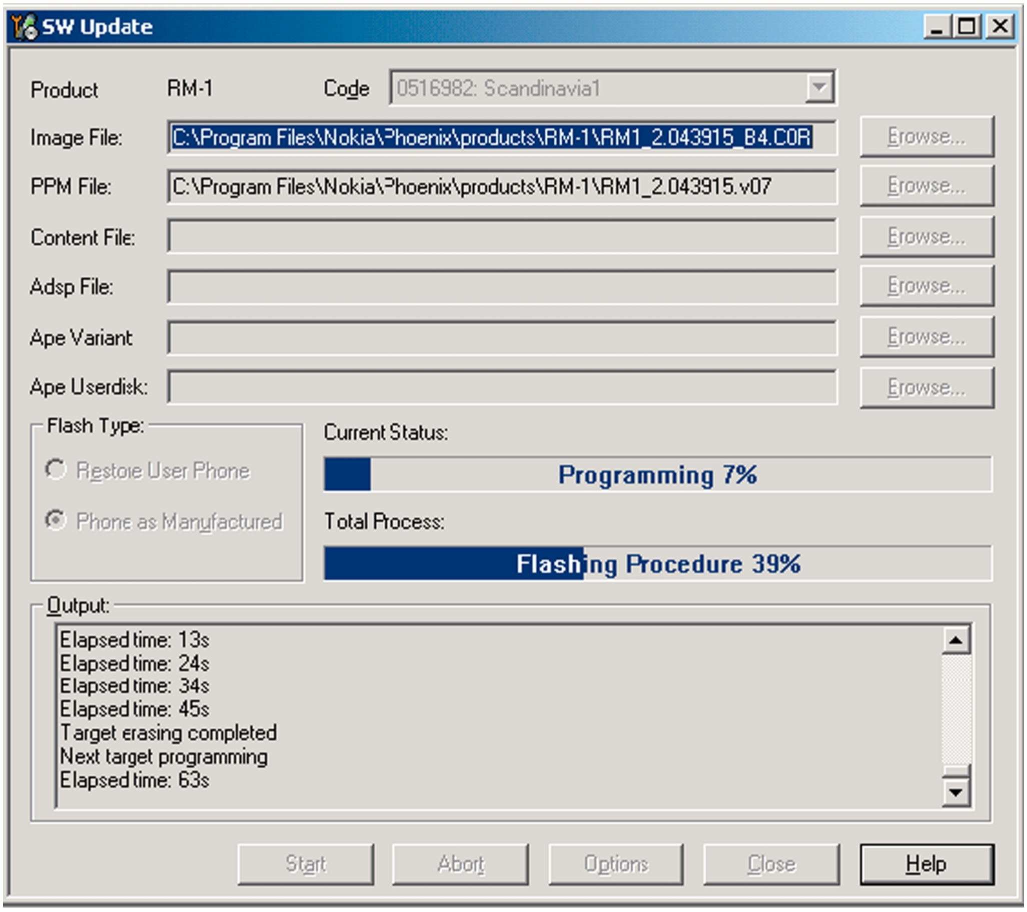
Flash Type:
○ Restore User Phone
● Phone as Manufactured

```
Reading phone information
No phone detected!
Reading flash settings from file(s)
Product string is empty.
Product code string is empty.
Production serial number is empty.
Procedure completed.
```

Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.


SW Update
Browse...
Browse...
Browse...
Browse...
Browse...
Browse...
Flash Type:
Restore User Phone
Start
Abort
Options
Close
Help

Product RM-1
Code 0516982: Scandinavia1
Image File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915_B4.C0R
PPM File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915.v07
Content File:
Adsp File:
Ape Variant
Ape Userdisk:
Flash Type: ○ Restore User Phone ● Phone as Manufactured
Current Status: Programming 7%
Total Process: Flashing Procedure 39%
Output:

```
Elapsed time: 13s
Elapsed time: 24s
Elapsed time: 34s
Elapsed time: 45s
Target erasing completed
Next target programming
Elapsed time: 63s
```

Programming is completed when *Flashing Completed* message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

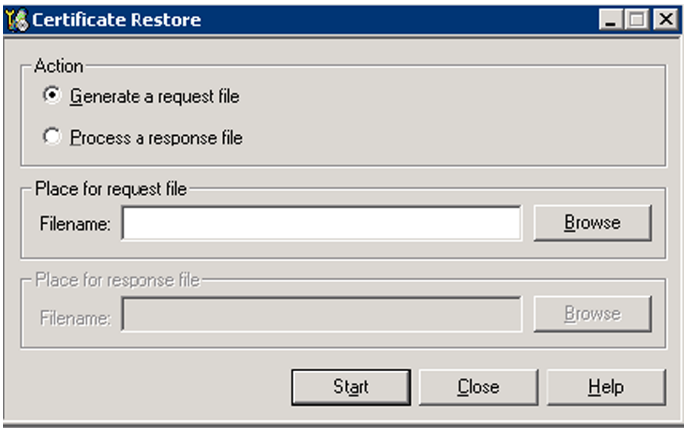
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i To connect the phone with *Phoenix*, choose **File→Scan Product** .

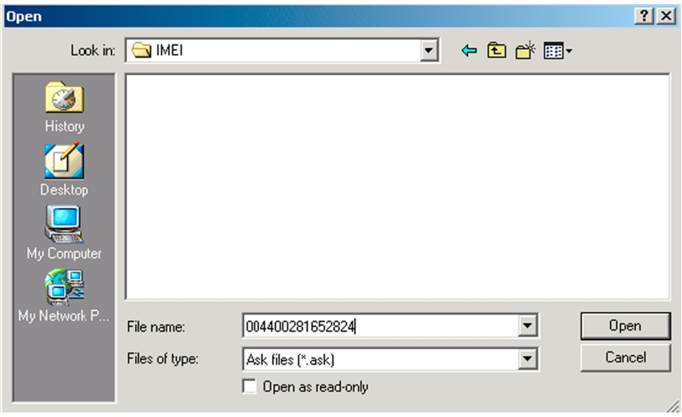
ii Choose **Tools→Certificate Restore** .

iii To choose a location for the request file, click **Browse**.


Certificate Restore
Place for request file
Browse
Place for response file
Filename:
Browse
Start
Close
Help

Action
● Generate a request file
○ Process a response file
Filename:

iv Name the file so that you can easily identify it, and click **Open**.


Open
History
Desktop
My Computer
My Network P...
Open
Cancel

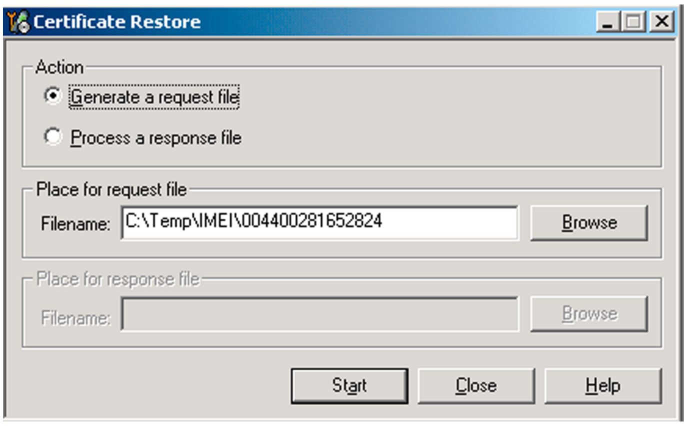
Look in: IMEI

File name: 004400281652824

Files of type: Ask files (*.ask)

☐ Open as read-only

The name of the file and its location are shown.


Certificate Restore
Browse
Browse
Start
Close
Help

Action

● Generate a request file

○ Process a response file

Place for request file

Filename: C:\Temp\IMEI\004400281652824

Place for response file

Filename:

v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

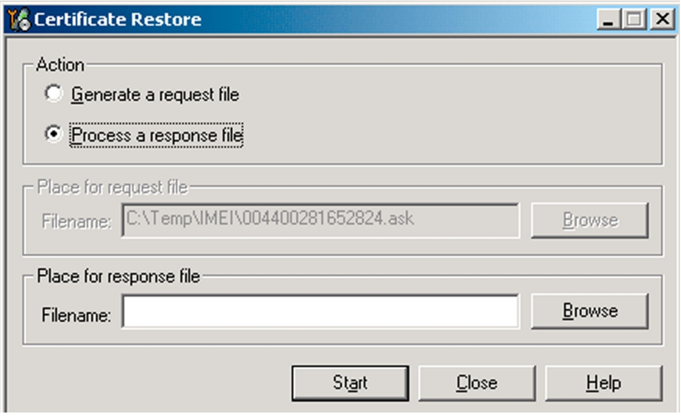
For this procedure, you must supply +12 V to CU-4 from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

iii Choose **File→Scan Product** .

iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.


Certificate Restore
Browse
Browse
Start
Close
Help

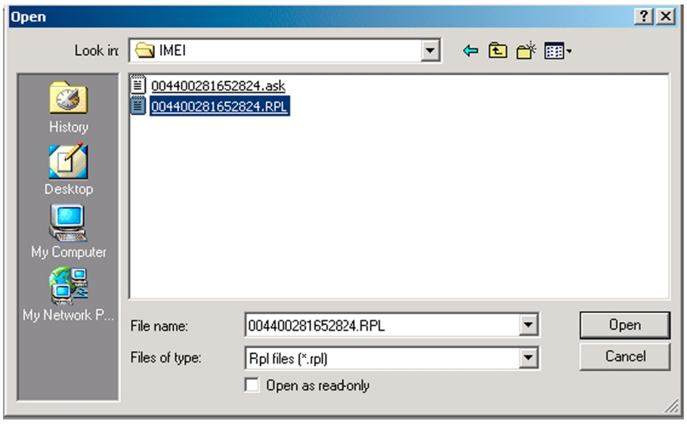
Action
○ Generate a request file
● Process a response file

Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask

Place for response file
Filename:

v To choose the location where response file is saved, click **Browse**.

vi Click **Open**.


Open
History
Desktop
My Computer
My Network P...
Open
Cancel

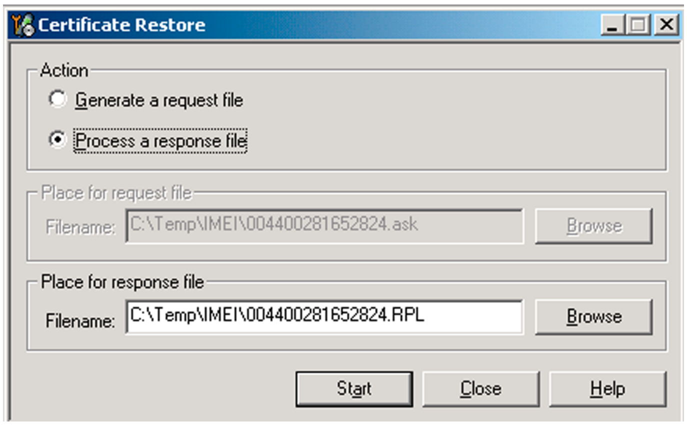
Look in: IMEI

004400281652824.ask
004400281652824.RPL

File name: 004400281652824.RPL
Files of type: Rpl files (*.rpl)
☐ Open as read-only

The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.


Certificate Restore
Browse
Browse
Start
Close
Help

Action
○ Generate a request file
● Process a response file

Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask

Place for response file
Filename: C:\Temp\IMEI\004400281652824.RPL

Next action

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- Display is in a partial idle mode when the phone is in the screen saver mode.
- The operating modes of the display can be controlled with the help of *Phoenix*.

Table 12 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 13 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Steps

1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.

2. Check that the cellular engine is working normally.

   i To check the functionality, connect the phone to a docking station.

   ii Start *Phoenix* service software.

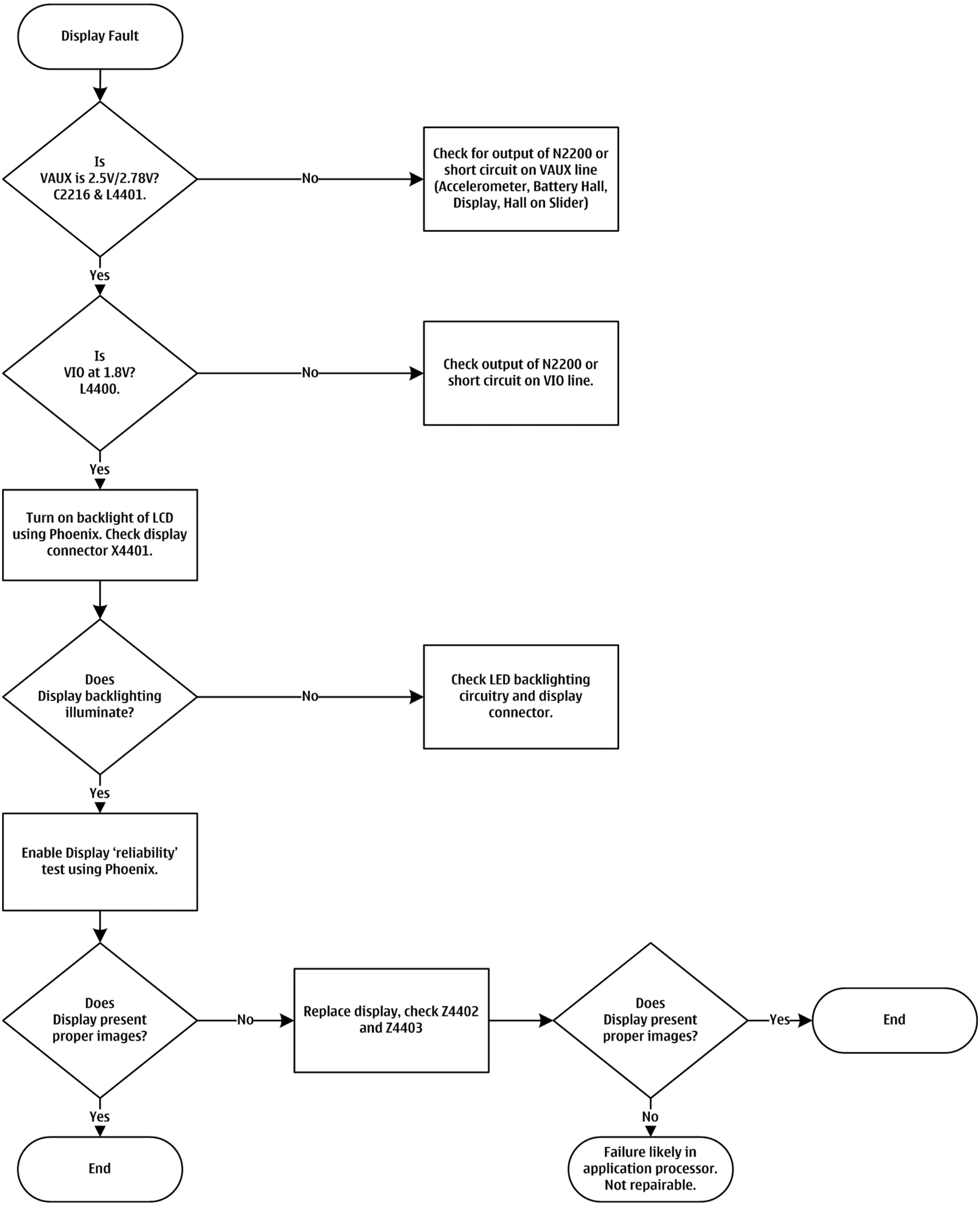
   iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

3. Proceed to the display troubleshooting flowcharts.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

Display troubleshooting

Troubleshooting flow


Display Fault
Is VAUX is 2.5V/2.78V? C2216 & L4401.
No
Check for output of N2200 or short circuit on VAUX line (Accelerometer, Battery Hall, Display, Hall on Slider)
Yes
Is VIO at 1.8V? L4400.
No
Check output of N2200 or short circuit on VIO line.
Yes
Turn on backlight of LCD using Phoenix. Check display connector X4401.
Does Display backlighting illuminate?
No
Check LED backlighting circuitry and display connector.
Yes
Enable Display 'reliability' test using Phoenix.
Does Display present proper images?
No
Replace display, check Z4402 and Z4403
Does Display present proper images?
Yes
End
No
Failure likely in application processor. Not repairable.
Yes
End

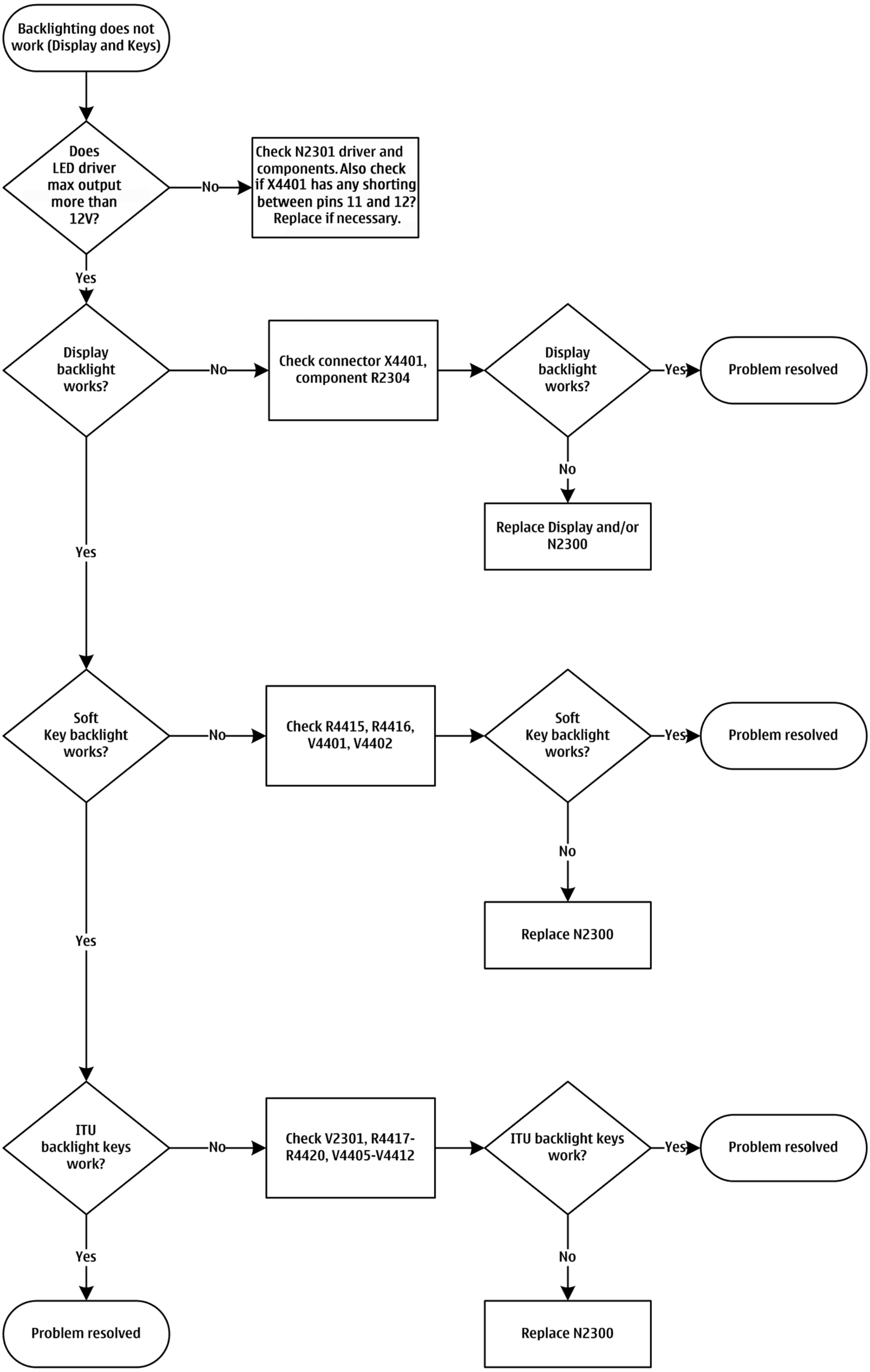
Display and keyboard backlight troubleshooting

Context

The device has one LED driver that provides current for both display and keyboard backlights.

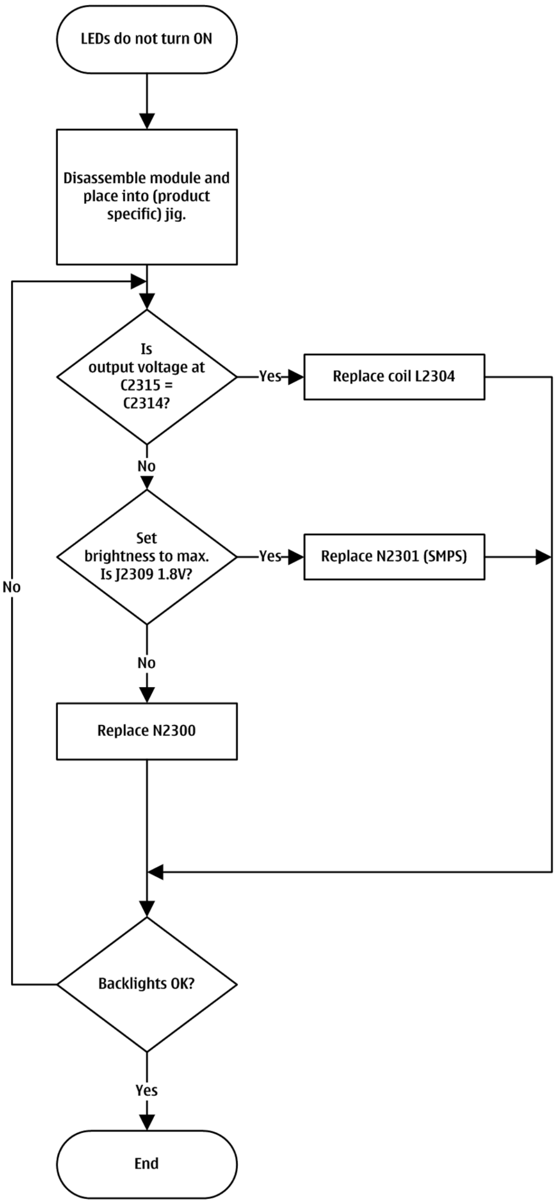
Display brightness can be adjusted manually.

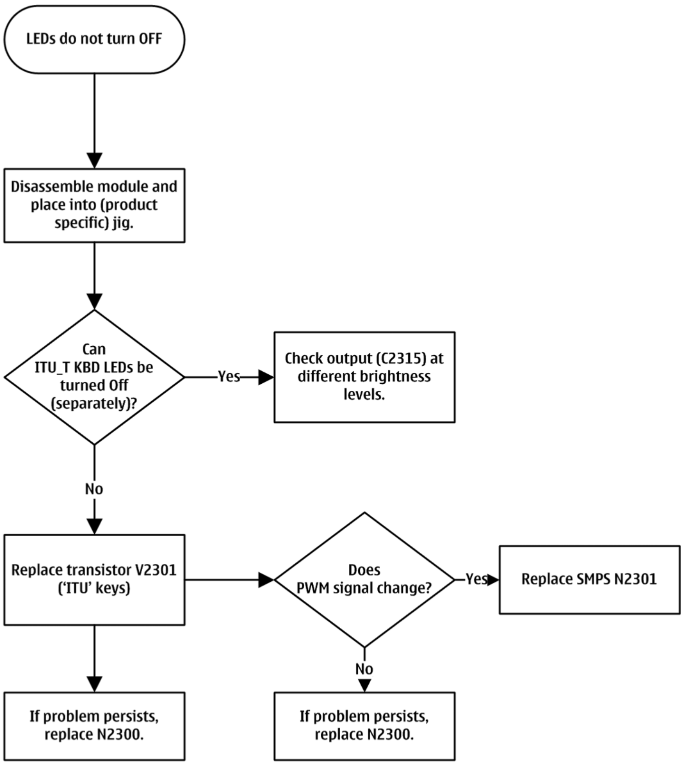
Troubleshooting flow


Backlighting does not work (Display and Keys)
Does LED driver max output more than 12V?
No
Check N2301 driver and components. Also check if X4401 has any shorting between pins 11 and 12? Replace if necessary.
Yes
Display backlight works?
No
Check connector X4401, component R2304
Display backlight works?
Yes
Problem resolved
No
Replace Display and/or N2300
Yes
Soft Key backlight works?
No
Check R4415, R4416, V4401, V4402
Soft Key backlight works?
Yes
Problem resolved
No
Replace N2300
Yes
ITU backlight keys work?
No
Check V2301, R4417-R4420, V4405-V4412
ITU backlight keys work?
Yes
Problem resolved
No
Replace N2300
Yes
Problem resolved

LED driver troubleshooting

Troubleshooting flow


LEDs do not turn ON
Disassemble module and place into (product specific) jig.
Is output voltage at C2315 = C2314?
Yes
Replace coil L2304
No
Set brightness to max. Is J2309 1.8V?
Yes
Replace N2301 (SMPS)
No
Replace N2300
No
Backlights OK?
Yes
End


LEDs do not turn OFF
Disassemble module and place into (product specific) jig.
Can ITU_T KBD LEDs be turned Off (separately)?
Yes
Check output (C2315) at different brightness levels.
No
Replace transistor V2301 ('ITU' keys)
Does PWM signal change?
Yes
Replace SMPS N2301
No
If problem persists, replace N2300.
If problem persists, replace N2300.

Bluetooth troubleshooting

Introduction to Bluetooth troubleshooting

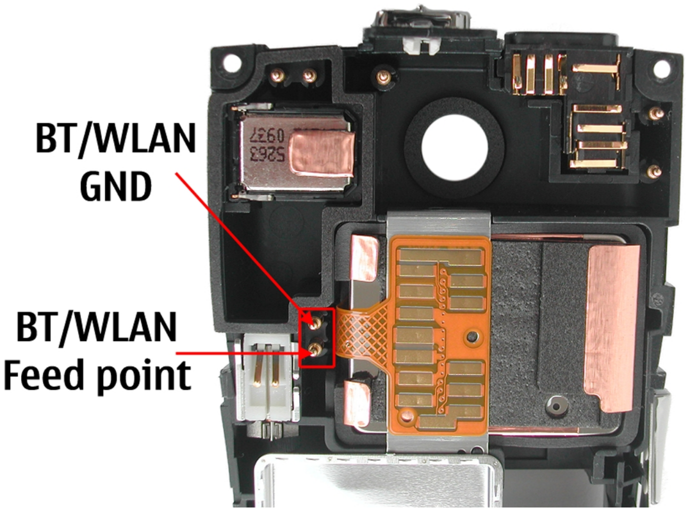
There are two main Bluetooth problems that can occur:

Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB.

Problem	Description
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

Location of the BT/WLAN antenna



Bluetooth settings for Phoenix

Steps

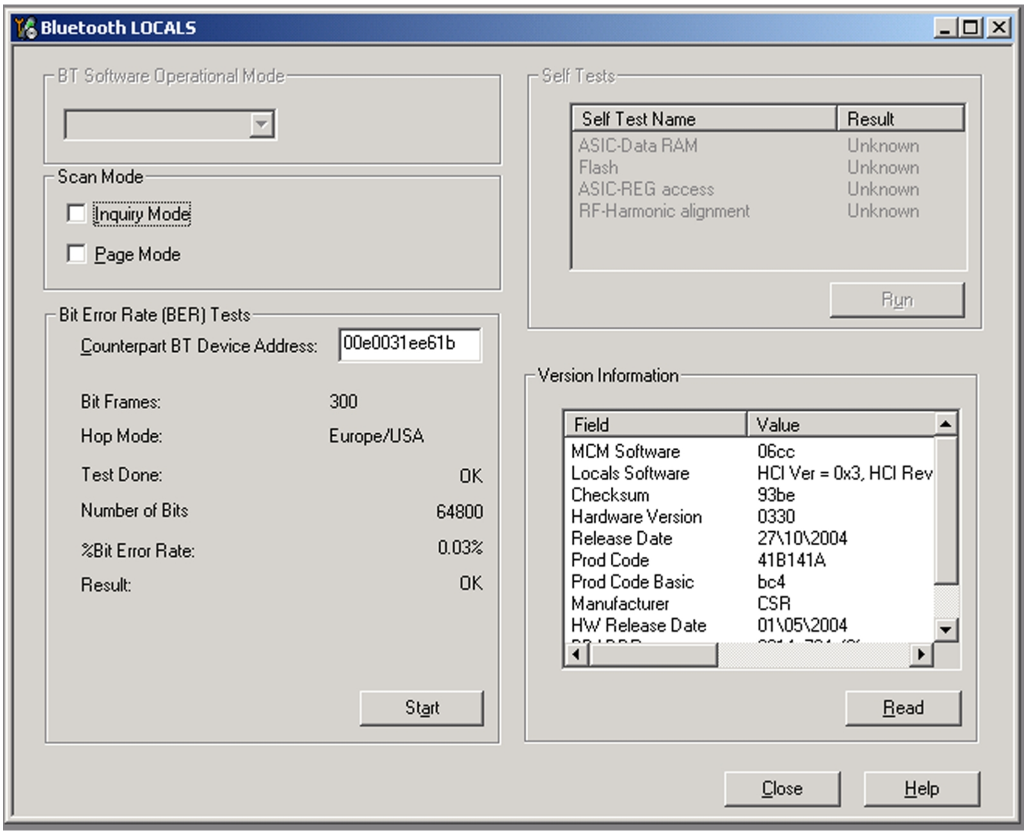
1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Place the phone to a flash adapter in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-9's serial number (12 digits) found in the type label on the back of JBT-9.

   In addition to JBT-9, also SB-6, JBT-3 and JBT-6 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

   This needs to be done only once provided that JBT-9 is not changed.
7. Place the JBT-9 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.


Bluetooth LOCALS
BT Software Operational Mode
Scan Mode
☐ Inquiry Mode
☐ Page Mode
Bit Error Rate (BER) Tests
Self Tests
Run
Version Information
Start
Read
Close
Help

Counterpart BT Device Address: 00e0031ee61b

Bit Frames: 300

Hop Mode: Europe/USA

Test Done: OK

Number of Bits 64800

%Bit Error Rate: 0.03%

Result: OK

Self Test Name	Result
ASIC-Data RAM	Unknown
Flash	Unknown
ASIC-REG access	Unknown
RF-Harmonic alignment	Unknown

Field	Value
MCM Software	06cc
Locals Software	HCI Ver = 0x3, HCI Rev
Checksum	93be
Hardware Version	0330
Release Date	27\10\2004
Prod Code	41B141A
Prod Code Basic	bc4
Manufacturer	CSR
HW Release Date	01\05\2004

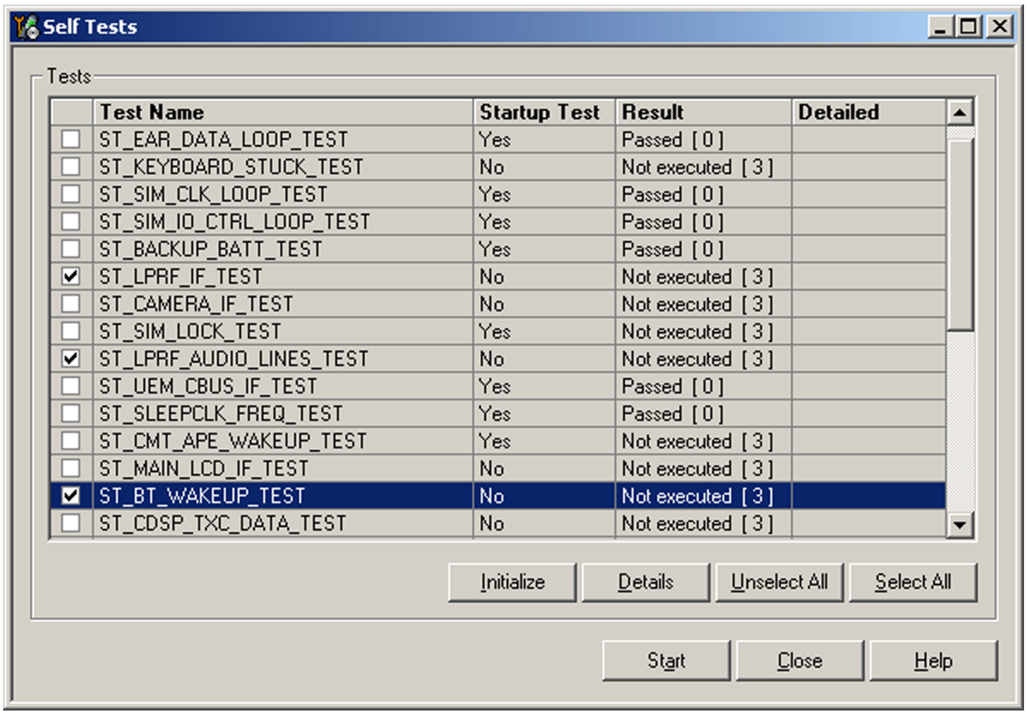
Figure 46 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.
5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
   - **ST_LPRF_IF_TEST**
   - **ST_LPRF_AUDIO_LINES_TEST**
   - **ST_BT_WAKEUP_TEST**

7. To run the tests, click **Start**.

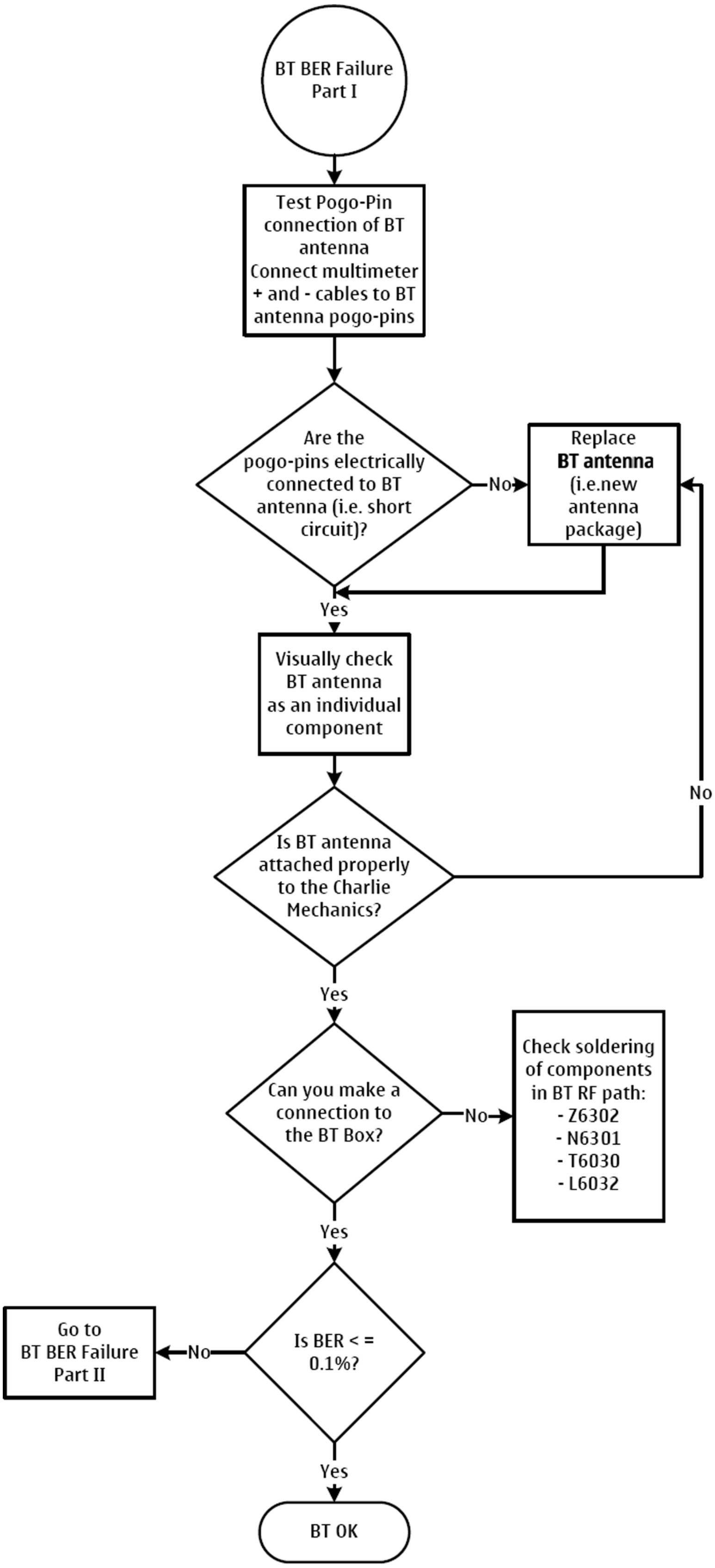


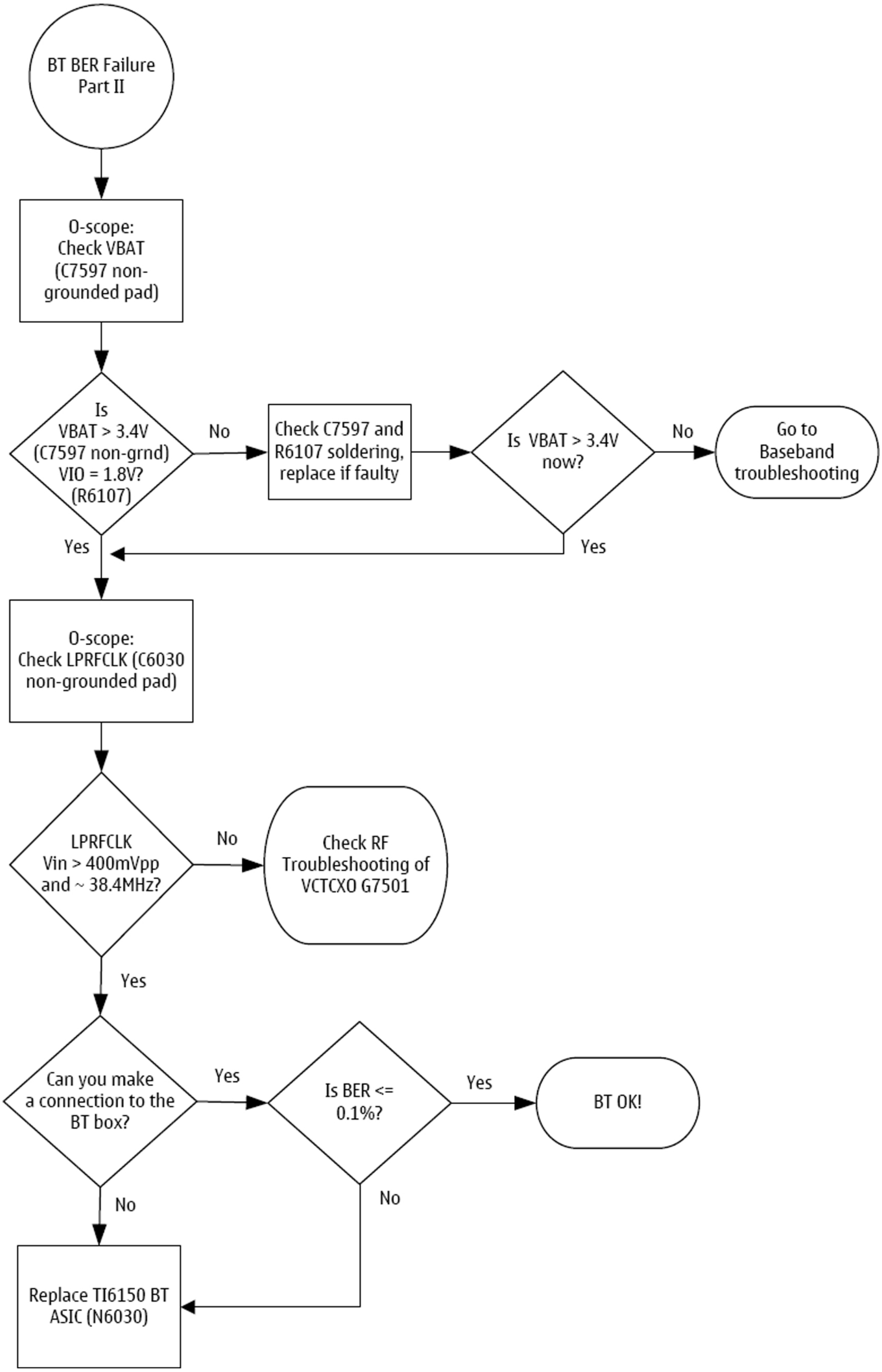
	Test Name	Startup Test	Result	Detailed
☐	ST_EAR_DATA_LOOP_TEST	Yes	Passed [0]	
☐	ST_KEYBOARD_STUCK_TEST	No	Not executed [3]	
☐	ST_SIM_CLK_LOOP_TEST	Yes	Passed [0]	
☐	ST_SIM_IO_CTRL_LOOP_TEST	Yes	Passed [0]	
☐	ST_BACKUP_BATT_TEST	Yes	Passed [0]	
☑	ST_LPRF_IF_TEST	No	Not executed [3]	
☐	ST_CAMERA_IF_TEST	No	Not executed [3]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☑	ST_LPRF_AUDIO_LINES_TEST	No	Not executed [3]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	Yes	Passed [0]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☑	ST_BT_WAKEUP_TEST	No	Not executed [3]	
☐	ST_CDSP_TXC_DATA_TEST	No	Not executed [3]	

Figure 47 Bluetooth self tests in *Phoenix*

Bluetooth BER failure troubleshooting

Troubleshooting flow


BT BER Failure Part I
Test Pogo-Pin connection of BT antenna Connect multimeter + and - cables to BT antenna pogo-pins
Are the pogo-pins electrically connected to BT antenna (i.e. short circuit)?
No
Replace **BT antenna** (i.e.new antenna package)
Yes
Visually check BT antenna as an individual component
Is BT antenna attached properly to the Charlie Mechanics?
No
Yes
Can you make a connection to the BT Box?
No
Check soldering of components in BT RF path:
- Z6302
- N6301
- T6030
- L6032
Yes
Is BER < = 0.1%?
No
Go to BT BER Failure Part II
Yes
BT OK


BT BER Failure Part II
O-scope: Check VBAT (C7597 non-grounded pad)
Is VBAT > 3.4V (C7597 non-grnd) VIO = 1.8V? (R6107)
No
Check C7597 and R6107 soldering, replace if faulty
Is VBAT > 3.4V now?
No
Go to Baseband troubleshooting
Yes
Yes
O-scope: Check LPRFCLK (C6030 non-grounded pad)
LPRFCLK Vin > 400mVpp and ~ 38.4MHz?
No
Check RF Troubleshooting of VCTCXO G7501
Yes
Can you make a connection to the BT box?
Yes
Is BER <= 0.1%?
Yes
BT OK!
No
No
Replace TI6150 BT ASIC (N6030)

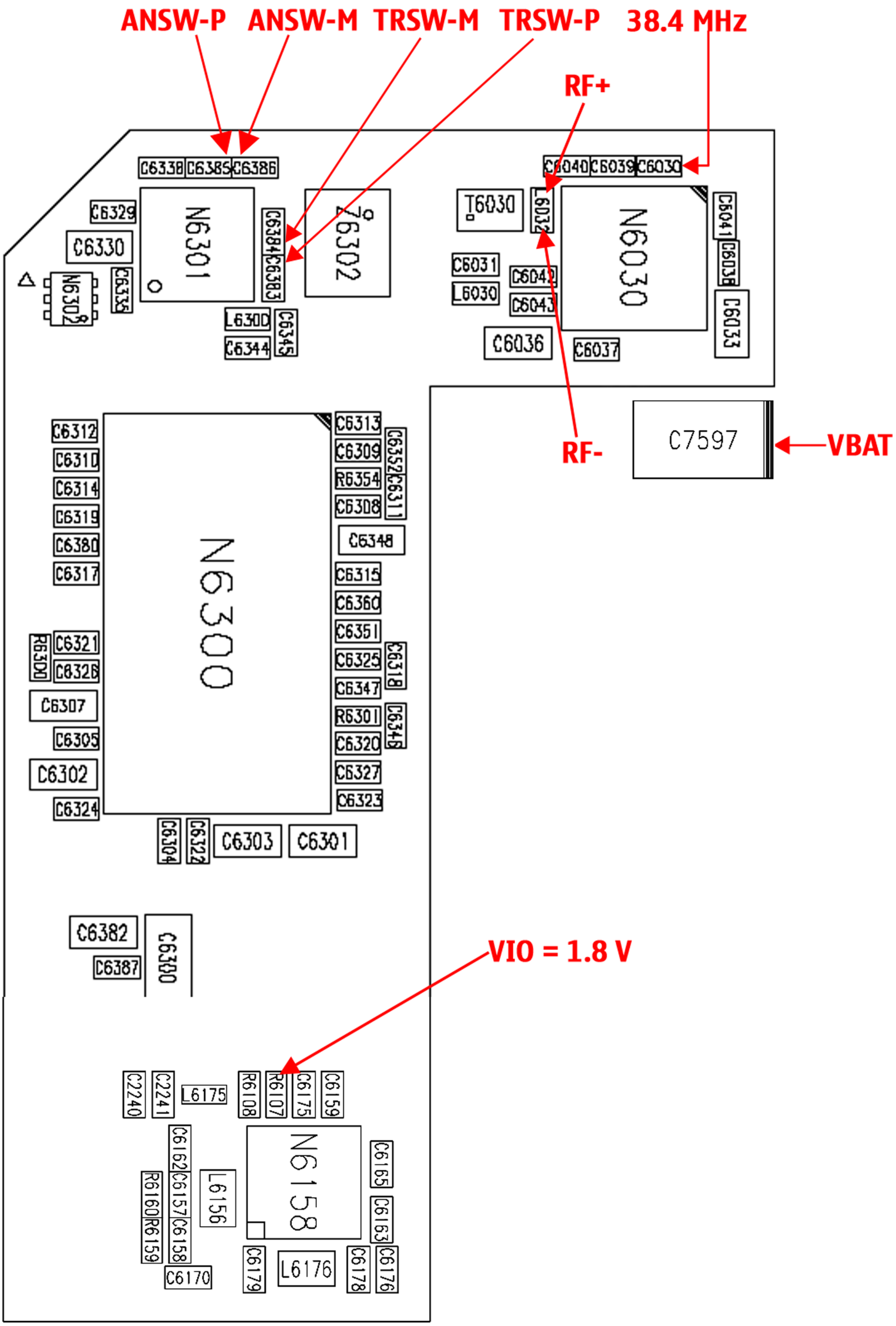
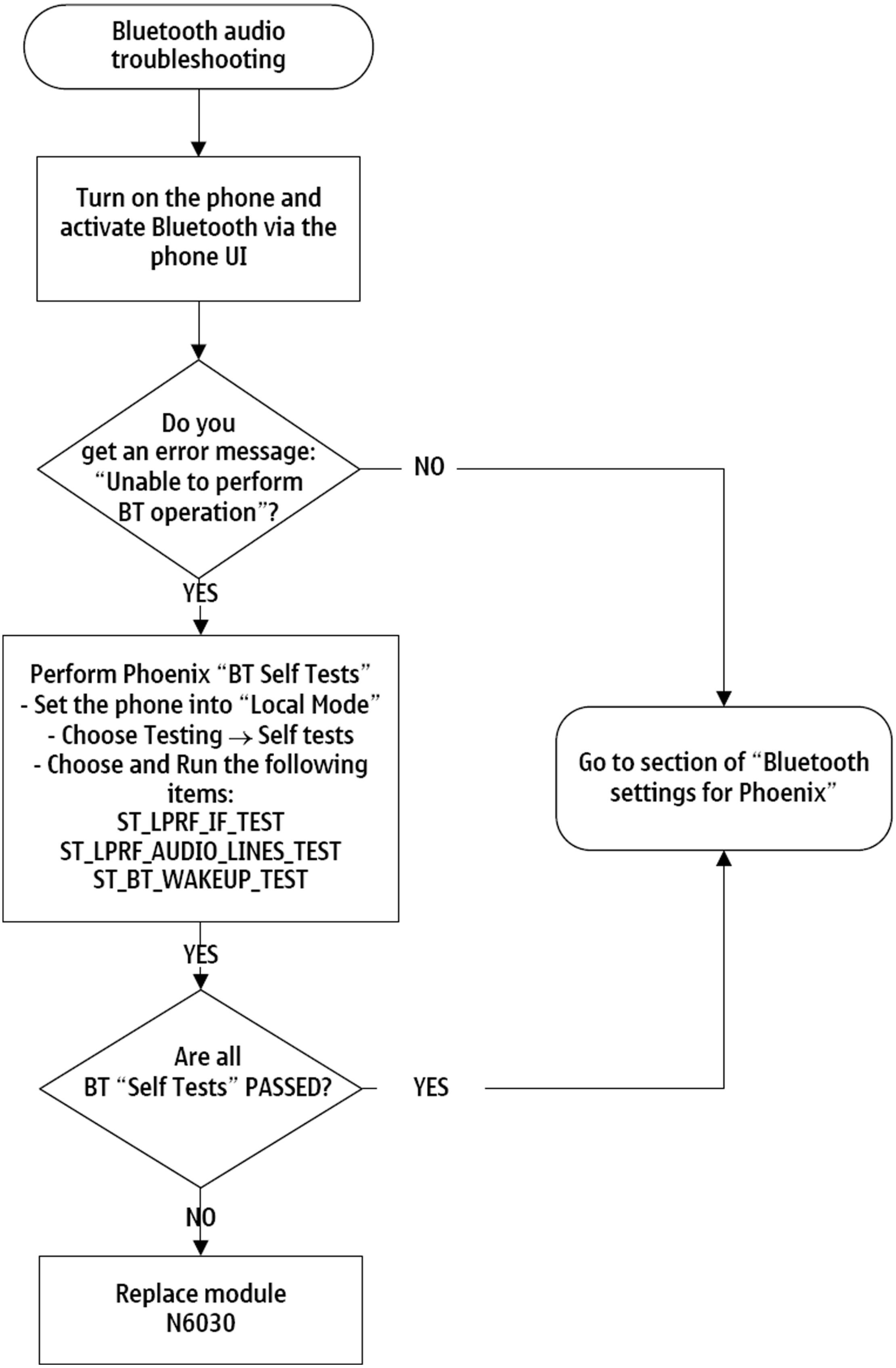

ANSW-P
ANSW-M
TRSW-M
TRSW-P
38.4 MHz
RF+
RF-
VBAT
VIO = 1.8 V
N6300
N6301
N6302
N6030
N6158
C7597
T6030
L6030
L6032
L6300
L6175
L6156
L6176
C6338
C6385
C6386
C6329
C6330
C6384
C6383
C6335
C6040
C6039
C6030
C6041
C6038
C6033
C6031
C6042
C6043
C6036
C6037
C6344
C6345
C6312
C6310
C6314
C6319
C6380
C6317
C6321
C6328
R6300
C6307
C6305
C6302
C6324
C6313
C6309
R6354
C6308
C6352
C6311
C6348
C6315
C6360
C6351
C6325
C6318
C6347
R6301
C6346
C6320
C6327
C6323
C6304
C6322
C6303
C6301
C6382
C6387
C6300
C2240
C2241
R6108
R6107
C6175
C6159
C6162
C6157
C6158
R6160
R6159
C6165
C6163
C6170
C6179
C6178
C6176

Figure 48 BT BER failure reference picture

BT audio failure troubleshooting

Troubleshooting flow


Bluetooth audio troubleshooting
Turn on the phone and activate Bluetooth via the phone UI
Do you get an error message: “Unable to perform BT operation”?
NO
YES
Perform Phoenix “BT Self Tests”
- Set the phone into “Local Mode”
- Choose Testing → Self tests
- Choose and Run the following items:
ST_LPRF_IF_TEST
ST_LPRF_AUDIO_LINES_TEST
ST_BT_WAKEUP_TEST
YES
Are all BT “Self Tests” PASSED?
YES
NO
Replace module N6030
Go to section of “Bluetooth settings for Phoenix”

Audio troubleshooting

Audio troubleshooting test instructions

Differential internal earpiece and single-ended external earpiece outputs can be measured either with a differential or a single-ended probe.

When measuring with a single-ended probe each output is measured against the ground.

The internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2 kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7 V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7 V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVrms]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
MIC+ and MIC-. Output is from a power amp, but may also be a line in recording.	MIC+	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	MIC-	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
Line in to Internal earpiece.	Line1L+	EarP and GND	6	50	600	1.2	NA
		EarN and GND					
	Line1L-	EarP and GND					
		EarN and GND					
External Mic to IHF Speaker.	XMICP and GND	B2102 pads	20	50	560	0	25mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to 3.5mm Headphone.	MIC1P, MIC1N. Mic is located on the slide.	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

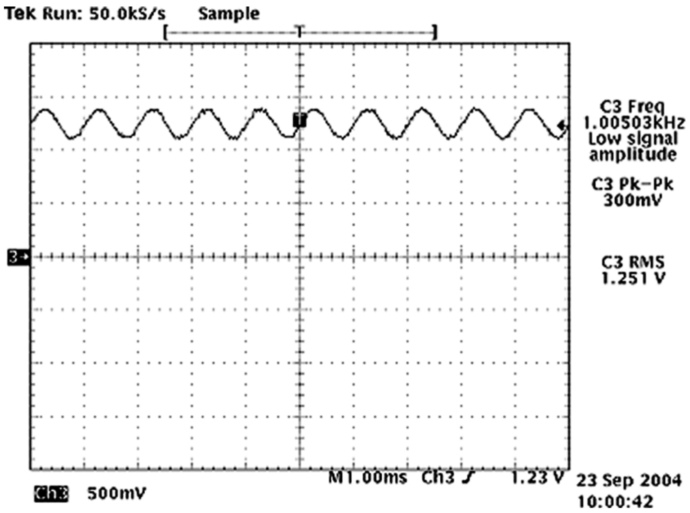
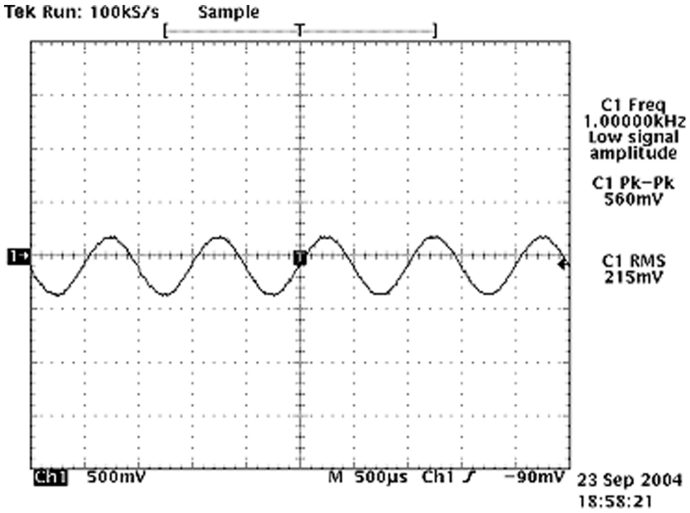


Figure 49 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 50 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

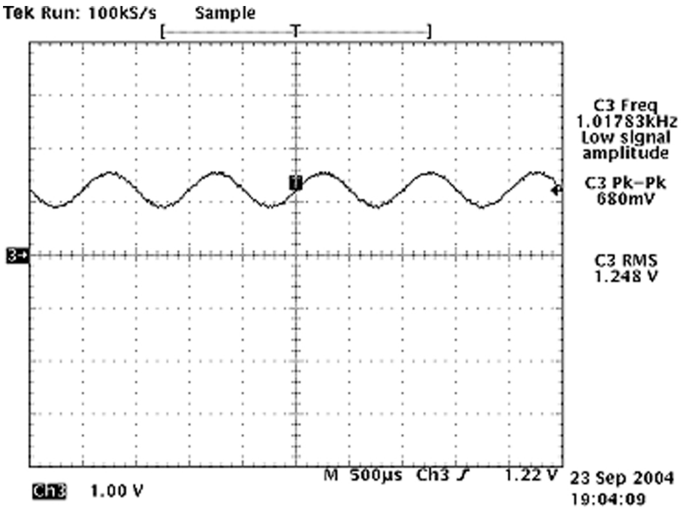
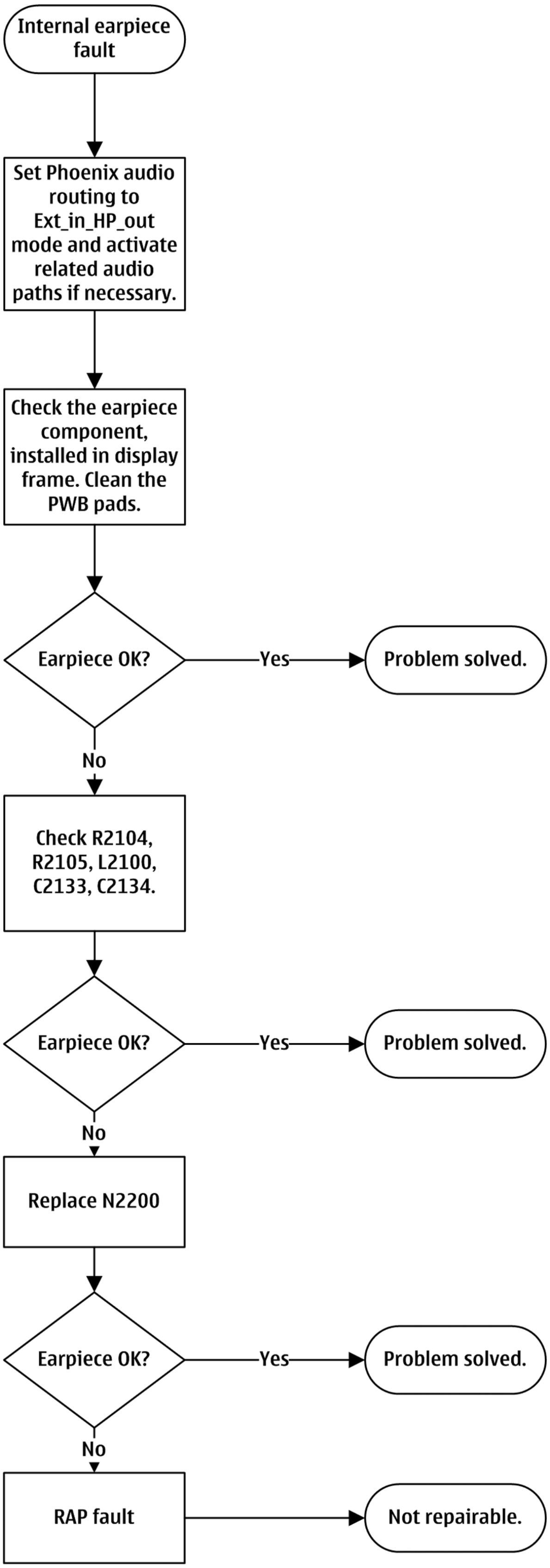

Tek Run: 100kS/s
Sample
C3 Freq
1.01783kHz
Low signal
amplitude
C3 Pk-Pk
680mV
C3 RMS
1.248 V
3
Ch3
1.00 V
M 500µs Ch3 ∫ 1.22 V
23 Sep 2004
19:04:09

Figure 51 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

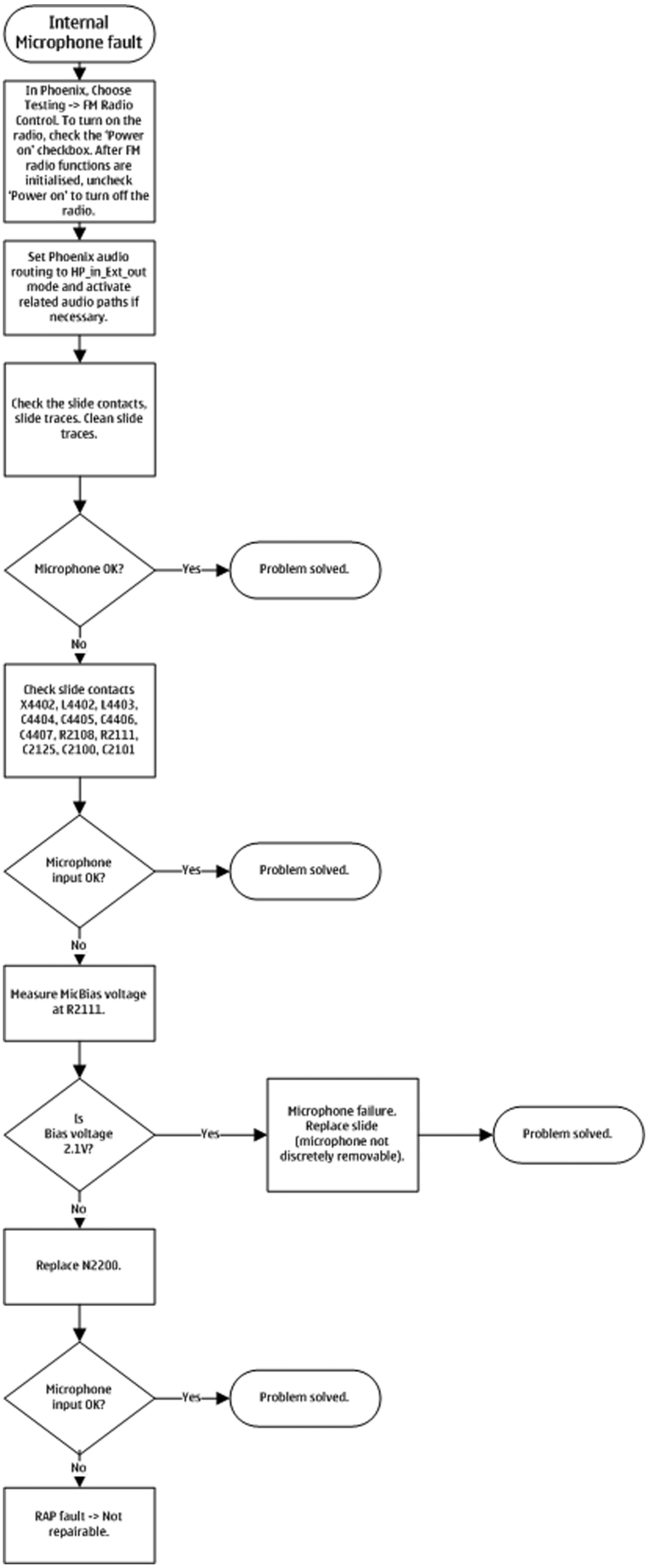
Internal earpiece troubleshooting

Troubleshooting flow


Internal earpiece fault
Set Phoenix audio routing to Ext_in_HP_out mode and activate related audio paths if necessary.
Check the earpiece component, installed in display frame. Clean the PWB pads.
Earpiece OK?
Yes
Problem solved.
No
Check R2104, R2105, L2100, C2133, C2134.
Earpiece OK?
Yes
Problem solved.
No
Replace N2200
Earpiece OK?
Yes
Problem solved.
No
RAP fault
Not repairable.

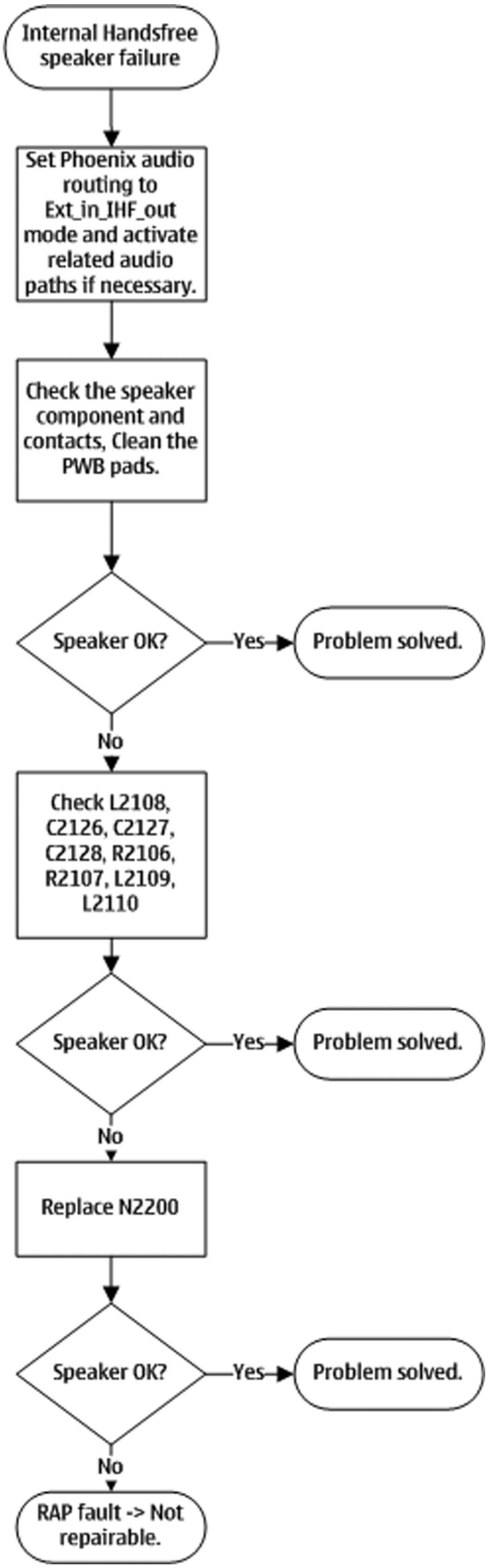
Internal microphone troubleshooting

Troubleshooting flow


Internal Microphone fault
In Phoenix, Choose Testing -> FM Radio Control. To turn on the radio, check the 'Power on' checkbox. After FM radio functions are initialised, uncheck 'Power on' to turn off the radio.
Set Phoenix audio routing to HP_in_Ext_out mode and activate related audio paths if necessary.
Check the slide contacts, slide traces. Clean slide traces.
Microphone OK?
Yes
Problem solved.
No
Check slide contacts X4402, L4402, L4403, C4404, C4405, C4406, C4407, R2108, R2111, C2125, C2100, C2101
Microphone input OK?
Yes
Problem solved.
No
Measure MicBias voltage at R2111.
Is Bias voltage 2.1V?
Yes
Microphone failure. Replace slide (microphone not discretely removable).
Problem solved.
No
Replace N2200.
Microphone input OK?
Yes
Problem solved.
No
RAP fault -> Not repairable.

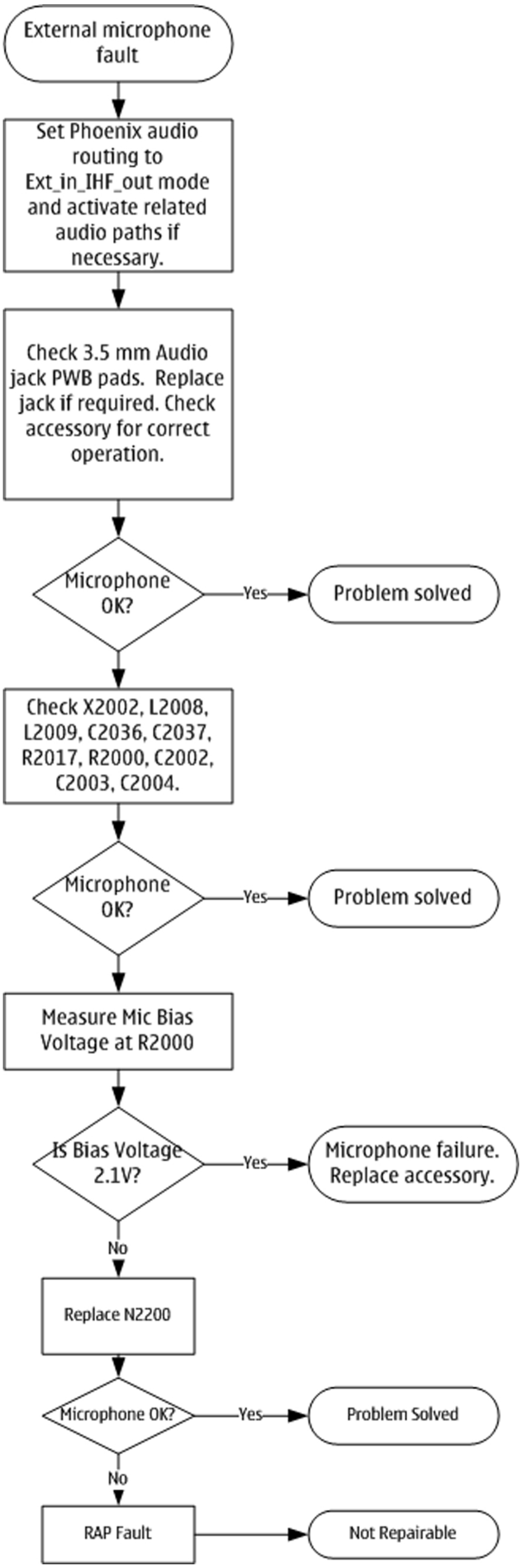
Internal handsfree speaker troubleshooting

Troubleshooting flow


Internal Handsfree speaker failure
Set Phoenix audio routing to Ext_in_IHF_out mode and activate related audio paths if necessary.
Check the speaker component and contacts, Clean the PWB pads.
Speaker OK?
Yes
Problem solved.
No
Check L2108, C2126, C2127, C2128, R2106, R2107, L2109, L2110
Speaker OK?
Yes
Problem solved.
No
Replace N2200
Speaker OK?
Yes
Problem solved.
No
RAP fault -> Not repairable.

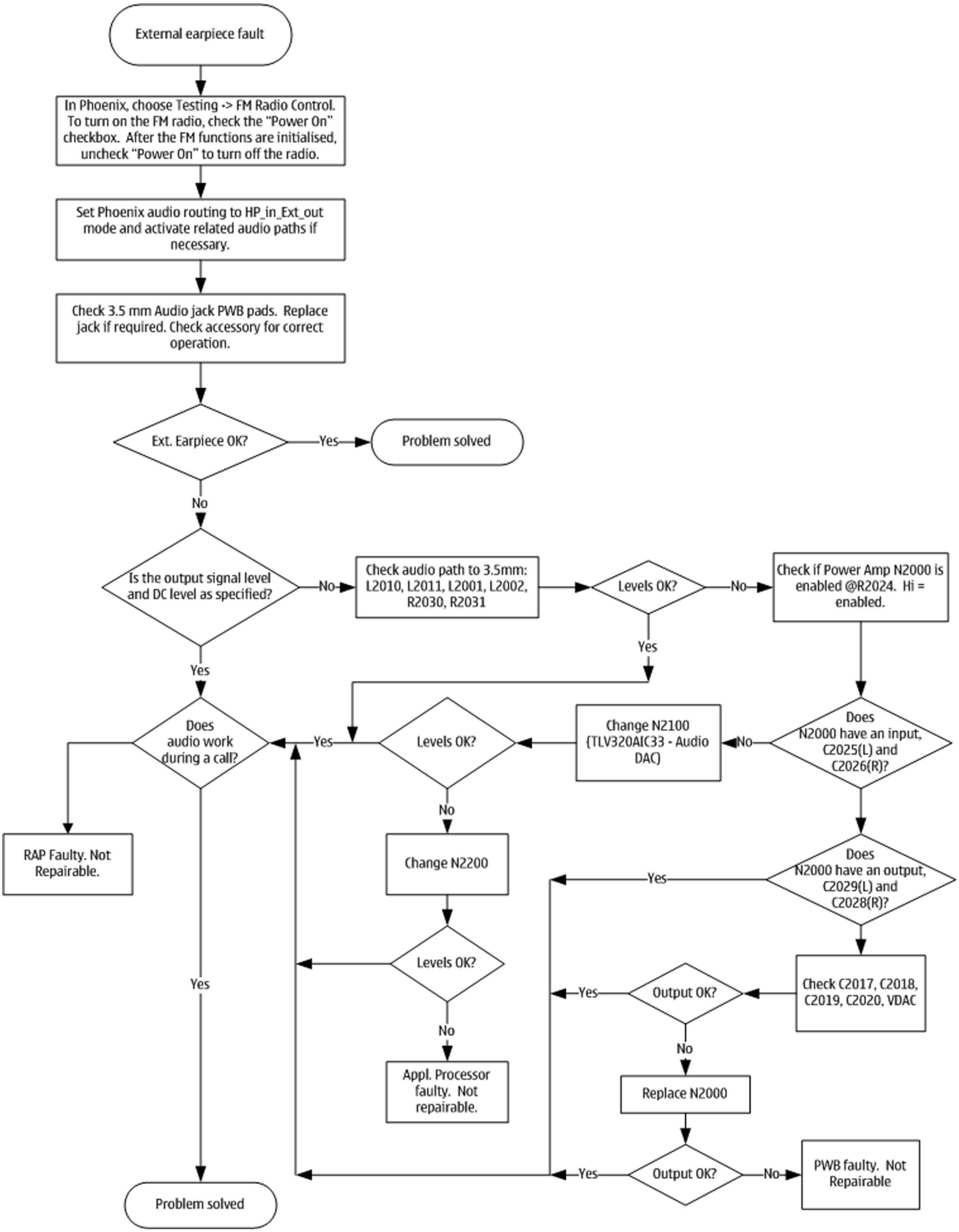
External microphone troubleshooting

Troubleshooting flow


External microphone fault
Set Phoenix audio routing to Ext_in_IHF_out mode and activate related audio paths if necessary.
Check 3.5 mm Audio jack PWB pads. Replace jack if required. Check accessory for correct operation.
Microphone OK?
Yes
Problem solved
Check X2002, L2008, L2009, C2036, C2037, R2017, R2000, C2002, C2003, C2004.
Microphone OK?
Yes
Problem solved
Measure Mic Bias Voltage at R2000
Is Bias Voltage 2.1V?
Yes
Microphone failure. Replace accessory.
No
Replace N2200
Microphone OK?
Yes
Problem Solved
No
RAP Fault
Not Repairable

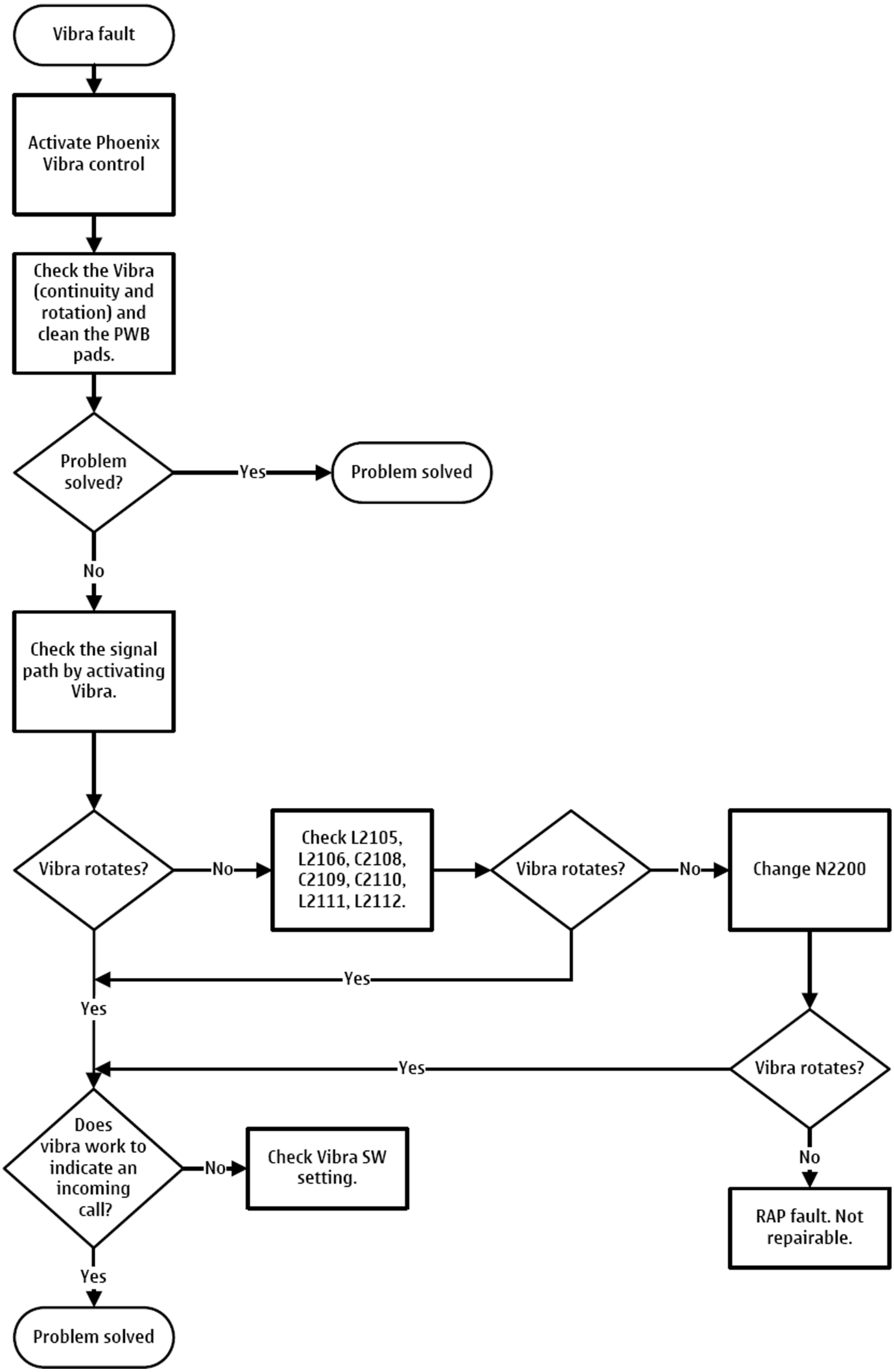
External earpiece troubleshooting

Troubleshooting flow


External earpiece fault
In Phoenix, choose Testing -> FM Radio Control. To turn on the FM radio, check the "Power On" checkbox. After the FM functions are initialised, uncheck "Power On" to turn off the radio.
Set Phoenix audio routing to HP_in_Ext_out mode and activate related audio paths if necessary.
Check 3.5 mm Audio jack PWB pads. Replace jack if required. Check accessory for correct operation.
Ext. Earpiece OK?
Yes
Problem solved
No
Is the output signal level and DC level as specified?
No
Check audio path to 3.5mm: L2010, L2011, L2001, L2002, R2030, R2031
Levels OK?
No
Check if Power Amp N2000 is enabled @R2024. Hi = enabled.
Yes
Yes
Does audio work during a call?
Yes
Levels OK?
Change N2100 (TLV320AIC33 - Audio DAC)
No
Does N2000 have an input, C2025(L) and C2026(R)?
RAP Faulty. Not Repairable.
No
Change N2200
Yes
Does N2000 have an output, C2029(L) and C2028(R)?
Levels OK?
Yes
Output OK?
Check C2017, C2018, C2019, C2020, VDAC
Yes
No
No
Appl. Processor faulty. Not repairable.
Replace N2000
Yes
Output OK?
No
PWB faulty. Not Repairable
Problem solved

Vibra troubleshooting

Troubleshooting flow


Vibra fault
Activate Phoenix Vibra control
Check the Vibra (continuity and rotation) and clean the PWB pads.
Problem solved?
Yes
Problem solved
No
Check the signal path by activating Vibra.
Vibra rotates?
No
Check L2105, L2106, C2108, C2109, C2110, L2111, L2112.
Vibra rotates?
No
Change N2200
Yes
Yes
Vibra rotates?
Yes
No
RAP fault. Not repairable.
Does vibra work to indicate an incoming call?
No
Check Vibra SW setting.
Yes
Problem solved

Baseband manual tuning guide

Energy management calibration

Before you begin

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.

8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 14 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

7 — RF Troubleshooting and Tuning Guide

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Table of Contents

Introduction to RF troubleshooting....7–5
RF key component placement....7–5
Troubleshooting test point locations....7–7
Receiver troubleshooting....7–9
  Introduction to Rx troubleshooting....7–9
  GSM Rx chain activation for manual measurements / GSM RSSI measurement....7–9
  WCDMA Rx chain activation for manual measurement....7–10
  WCDMA RSSI measurement....7–11
Transmitter troubleshooting....7–12
  General instructions for Tx troubleshooting....7–12
  Checking antenna functionality....7–15
RF tunings....7–17
  Introduction to RF tunings....7–17
  RF autotuning....7–17
  RF manual tuning guide....7–20
    Required manual tunings after component changes....7–20
    System mode independent manual tunings....7–21
      Rf channel filter calibration....7–21
      PA (power amplifier) detection....7–21
      Temperature sensor calibration 7–22
    GSM receiver tunings....7–22
      Rx calibration (GSM)....7–22
      Rx band filter response compensation (GSM)....7–25
      Rx AM suppression (GSM)....7–29
    GSM transmitter tunings....7–31
      Tx IQ tuning (GSM)....7–31
      Tx power level tuning (GSM)....7–33
    WCDMA receiver tunings....7–36
      Rx AGC alignment (WCDMA)....7–36
      Rx band response calibration (WCDMA)....7–37
    WCDMA transmitter tunings....7–40
      Tx AGC & power detector (WCDMA)....7–40
      Tx band response calibration (WCDMA)....7–46
      Tx LO leakage (WCDMA)....7–48
WLAN RF troubleshooting....7–48
  Introduction to WLAN RF troubleshooting....7–48
  General instructions for WLAN Tx troubleshooting....7–50
  WLAN Tx troubleshooting....7–52
  General instructions for WLAN Rx troubleshooting....7–53
  WLAN Rx troubleshooting....7–54
  STLC4370 troubleshooting....7–55
  RFMD 5924 troubleshooting....7–56

List of Tables

Table 15 Rf channel filter calibration tuning limits....7–21
Table 16 Temperature sensor calibration tuning limits....7–22
Table 17 RF tuning limits in Rx calibration....7–24
Table 18 RSSI level values....7–30
Table 19 Tx IQ tuning limits....7–32

List of Figures

Figure 52 RF key component placement....7–6
Figure 53 RF test components 1....7–7
Figure 54 RF test components 2....7–8
Figure 55 RF test components 3....7–8
Figure 56 RSSI Reading window....7–10
Figure 57 Rx Control window....7–11
Figure 58 RF Controls window....7–14
Figure 59 Tx Control window....7–15
Figure 60 Rf channel filter calibration typical values....7–21
Figure 61 High burst measurement....7–44
Figure 62 WLAN and Bluetooth key component placement....7–49
Figure 63 WLAN RF measurement points....7–50

Introduction to RF troubleshooting

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

> **Caution:** A mobile phone WCDMA transmitter should never be tested with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in wide area. WCDMA Tx measurements should be performed at least in an RF-shielded box and never with higher Tx power level than 0 dBm! Test full WCDMA Tx power only in RF-shielded environment.
>
> Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

The RF section of the phone is build around two RF ASICS: Rx ASIC and Tx ASIC. There are also two PAs (Power Amplifiers) on board, one for GSM and another for WCDMA.

The WCDMA PA needs variable supply voltage to work properly, and therefore there is a switched mode power supply component added to the PWB. Please note that the grounding of the PA module is directly below the PA module. Therefore, it is difficult to check or change the module.

Most RF semiconductors are static discharge sensitive. ESD protection must be taken care of during repair (ground straps and ESD soldering irons). The RF ASICs, both PAs and SMPS are moisture sensitive, so parts must be pre-baked prior to soldering.

In addition to key components, there are lot of discrete components (resistors, inductors and capacitors) which troubleshooting is done mainly by checking if the soldering of the component is done properly.

A Capacitor can be checked for shorts and resistors for value by means of an ohmmeter, but be aware, in-circuit measurements should be evaluated carefully.

Keep in mind that all measured voltages or RF levels in the service manual are rough figures. Especially RF levels vary because of different measuring equipment or different grounding of the probe used. All spectrum analyser measurements in this manual are made with a Fluke PM9639/011 10:1 (500 ohm) probe. It is recommended that a similar kind of probe is used for all troubleshooting measurements.

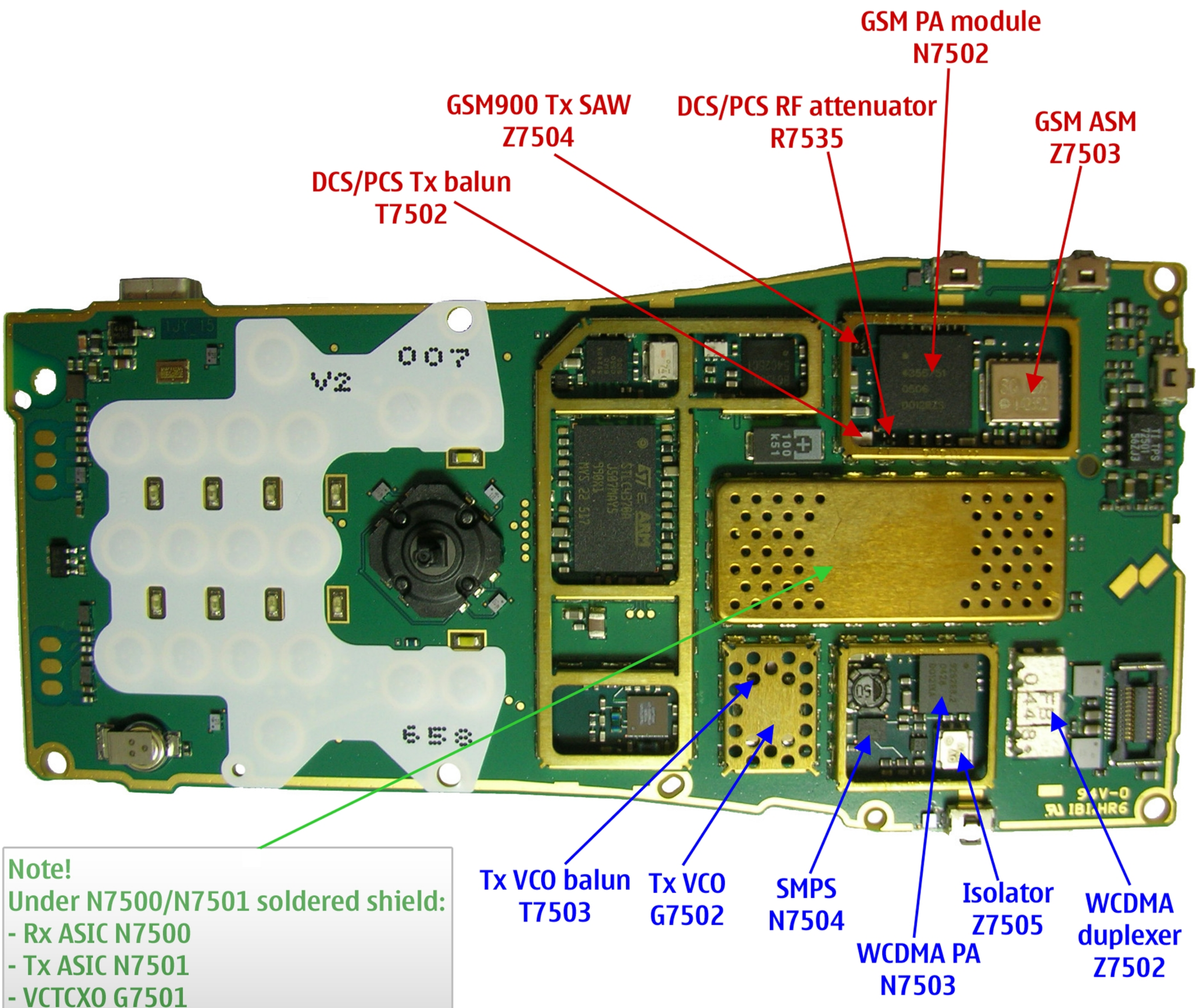
When using an RF probe, use a pair of metallic tweezers to connect the probe ground to the PWB ground as close to the measurement point as possible. If measurements are performed in a product specific module jig, then “GND” pads should be used for the probe ground.

For additional RF troubleshooting instructions, see Appendix A. These instructions include descriptions/instructions for RF self-tests as well as troubleshooting instructions for various fault cases.

RF key component placement

The RF section of the phone is build around two RF ASICs: Rx ASIC N7500 and Tx ASIC N7501.

There are also two PAs on the board, one for GSM (N7502) and one for WCDMA (N7503). The WCDMA PA needs variable supply voltage to work power efficiently and therefore there is a Switched Mode Power Supply (SMPS) component (N7504) added to the PWB.


GSM PA module
N7502
GSM900 Tx SAW
Z7504
DCS/PCS RF attenuator
R7535
GSM ASM
Z7503
DCS/PCS Tx balun
T7502
Tx VCO balun
T7503
Tx VCO
G7502
SMPS
N7504
Isolator
Z7505
WCDMA
duplexer
Z7502
WCDMA PA
N7503

Note!
Under N7500/N7501 soldered shield:
- Rx ASIC N7500
- Tx ASIC N7501
- VCTCXO G7501
- Rx VCO G7500
- Rx VCO balun T7501
- WCDMA Rx SAW Z7501
- WCDMA Rx balun T7500
- WCDMA Tx SAW Z7506

Figure 52 RF key component placement

Troubleshooting test point locations

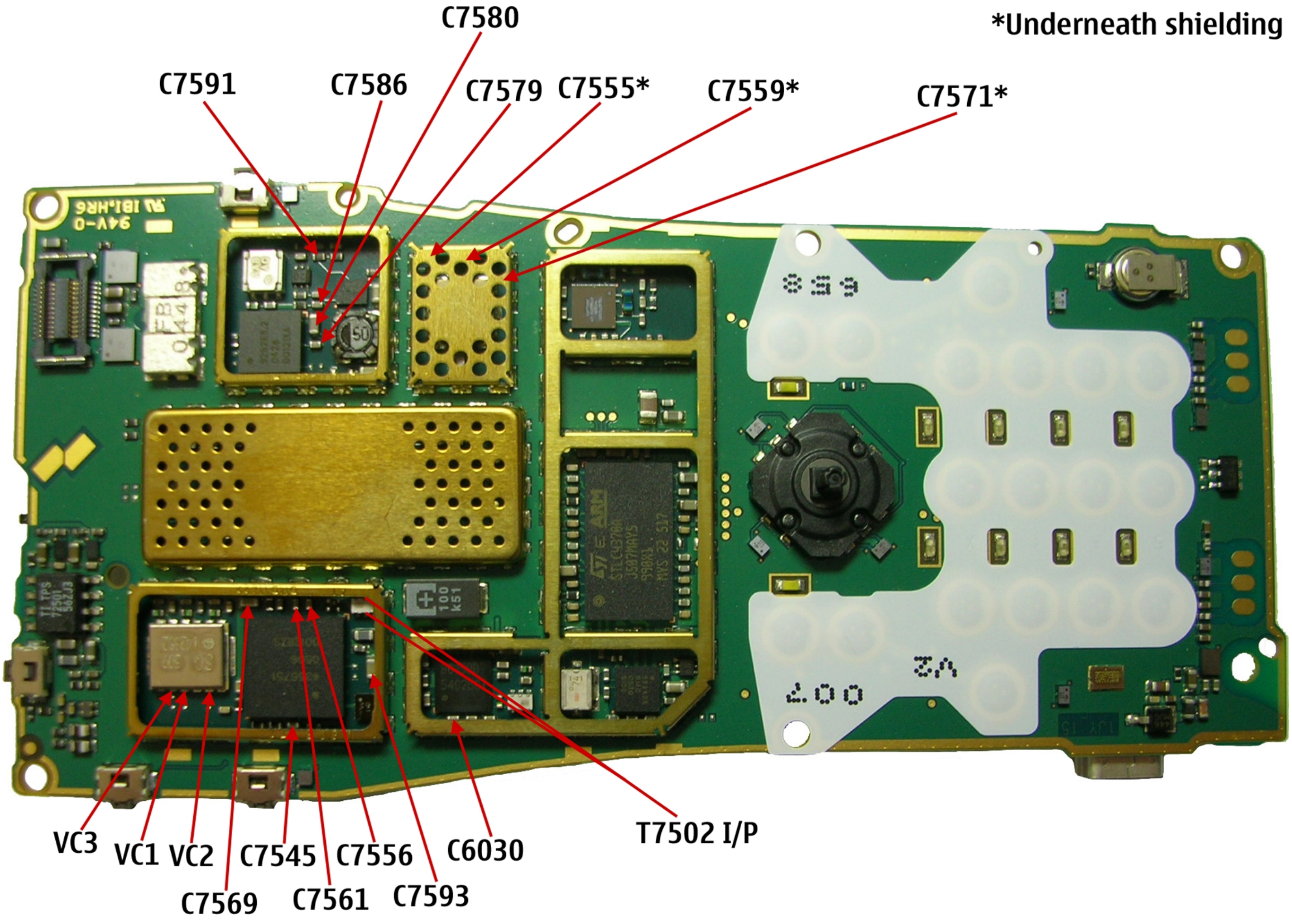
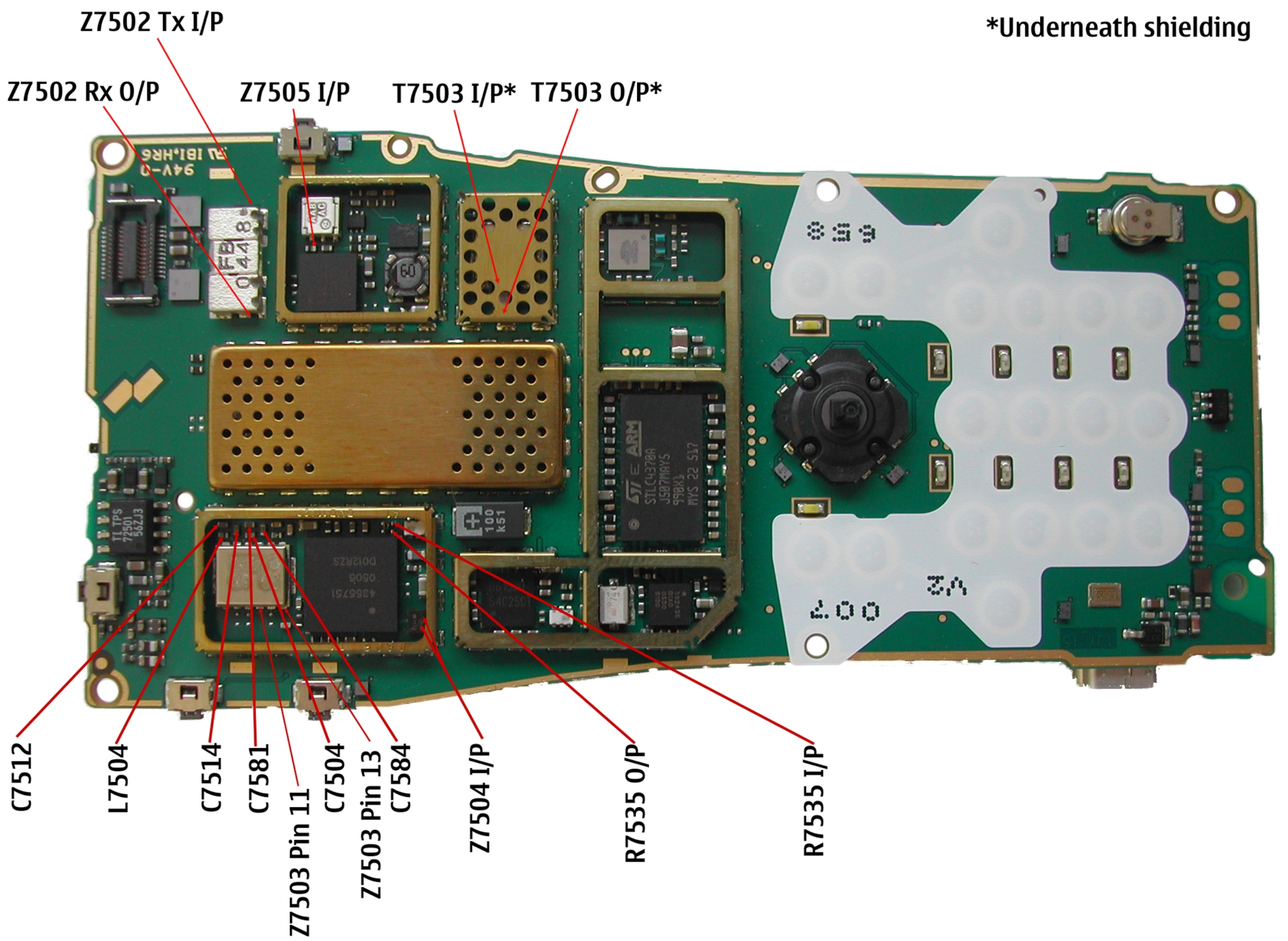

C7580
*Underneath shielding
C7591
C7586
C7579
C7555*
C7559*
C7571*
VC3
VC1
VC2
C7545
C7556
C6030
T7502 I/P
C7569
C7561
C7593

Figure 53 RF test components 1


Z7502 Tx I/P
Z7502 Rx O/P
Z7505 I/P
T7503 I/P*
T7503 O/P*
C7512
L7504
C7514
C7581
Z7503 Pin 11
C7504
Z7503 Pin 13
C7584
Z7504 I/P
R7535 O/P
R7535 I/P

*Underneath shielding

Figure 54 RF test components 2

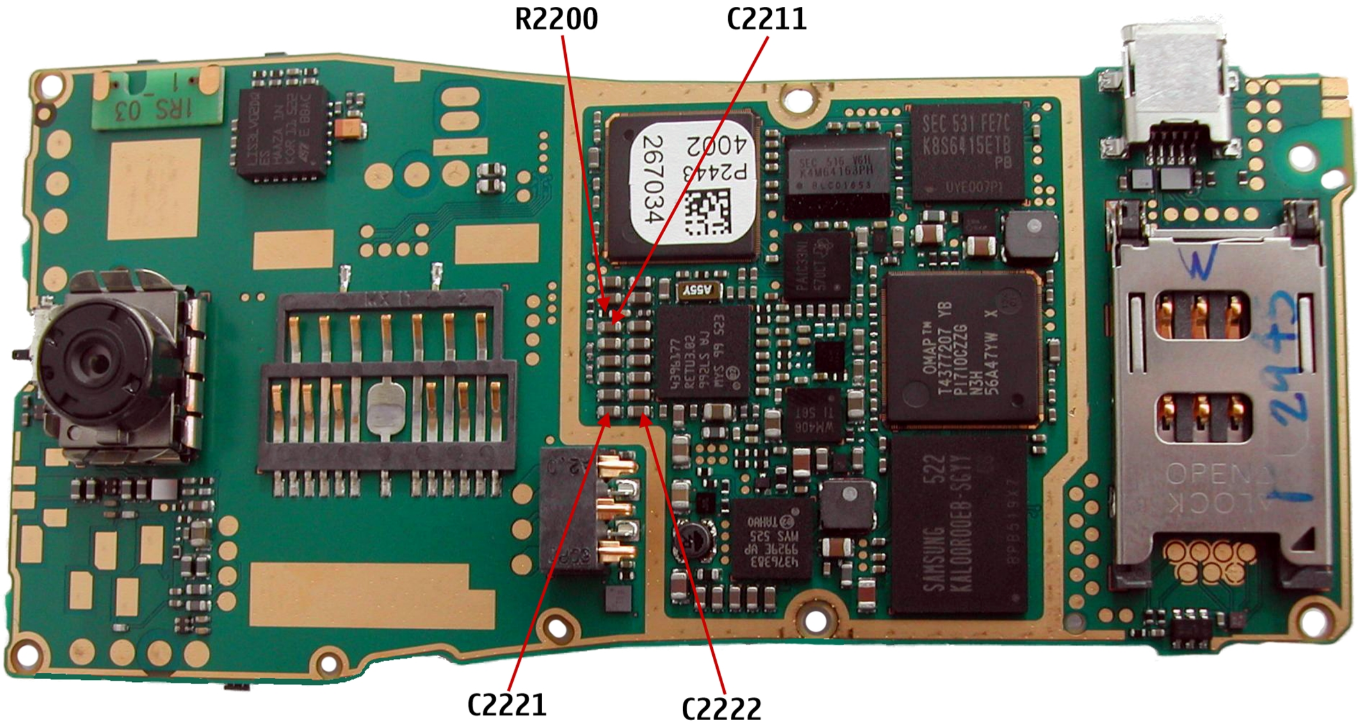

R2200
C2211
C2221
C2222

Figure 55 RF test components 3

Receiver troubleshooting

Introduction to Rx troubleshooting

Rx can be tested by making a phone call or in the local mode. For the local mode testing, use Phoenix service software.

The primary Rx troubleshooting parameter RSSI (Receiving Signal Strength Indicator). For GSM RSSI measurement, see GSM Rx chain activation for manual measurements / GSM RSSI measurement (page 7–9), and for the same measurement in WCDMA, see WCDMA RSSI measurement (page 7–11).

In GSM, the input signal can be either a real GSM signal or a CW (Continuous Wave) signal, which is 67.771 kHz above the carrier frequency.

In WCDMA, the input signal can be either a real WCDMA signal or a CW signal, which is 1 MHz above the carrier frequency.

For service tool usage instructions, refer to section **Service Tools and Service Concepts**.

See also

- WCDMA Rx chain activation for manual measurement (page 7–10)

GSM Rx chain activation for manual measurements / GSM RSSI measurement

Context

RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

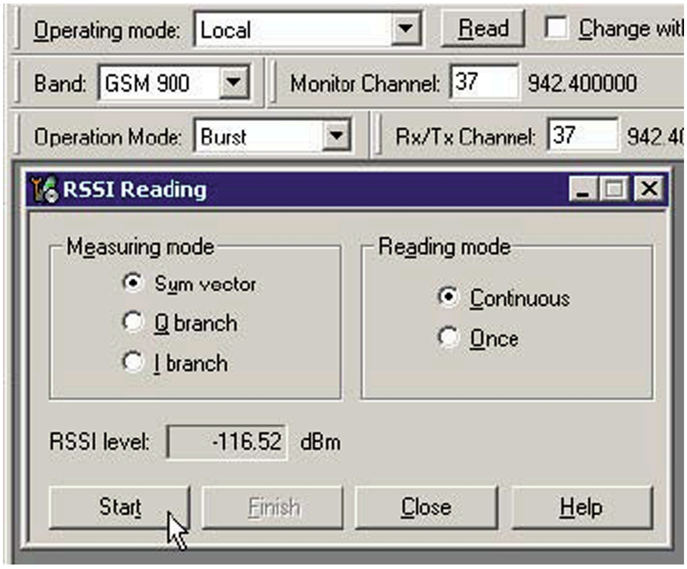
I and Q branches can be measured separately. In GSM, the input signal can be either real GSM signal or a CW (Continuous Wave) signal that is 67.771 kHz above the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→GSM→RSSI Reading** .
3. Set the RF signal generator for channel frequency +67.771 kHz CW mode with –80 dBm signal.

   Alternatively set the cellular tester downlink channel to the appropriate channel. Make sure that the tester is set to continuous mode, not to burst mode.

4. In the *RSSI Reading* window, select the appropriate band and channel.



Operating mode: Local

☐ Change wit

Band: GSM 900

Monitor Channel: 37 942.400000

Operation Mode: Burst

Rx/Tx Channel: 37 942.4

Measuring mode

● Sum vector

○ Q branch

○ I branch

Reading mode

● Continuous

○ Once

RSSI level: -116.52 dBm

Figure 56 *RSSI Reading* window

5. To start the measurement, activate GSM Rx chain, click **Start**.

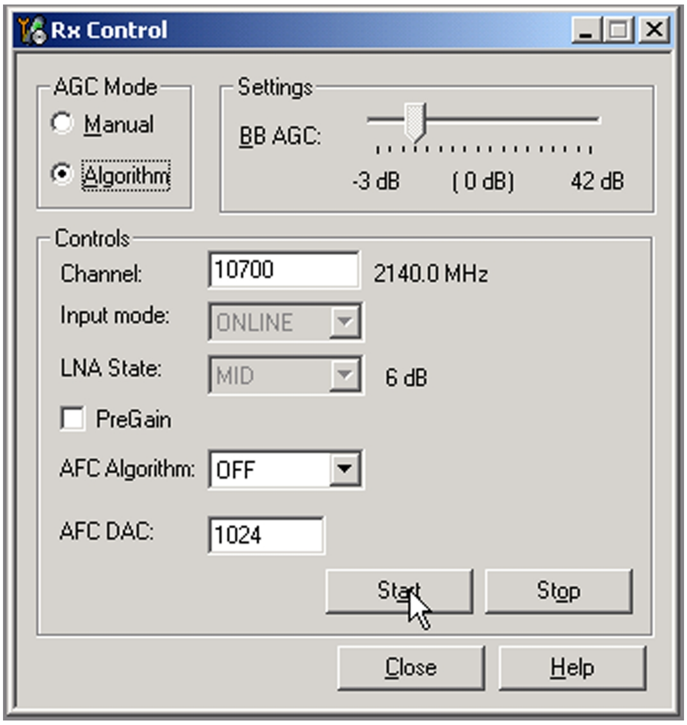
Results

RSSI reading values of the selected band and channel are displayed. The RSSI level must be the same value which is set at the signal generator (-90 dBm).

WCDMA Rx chain activation for manual measurement

Steps

1. Start *Phoenix* service software.
2. Choose **Testing**→**WCDMA**→**Rx Control** .
3. In the *Rx Control* window:



AGC Mode
○ Manual
● Algorithm

Settings
BB AGC: -3 dB (0 dB) 42 dB

Controls
Channel: 10700 2140.0 MHz
Input mode: ONLINE
LNA State: MID 6 dB
☐ PreGain
AFC Algorithm: OFF
AFC DAC: 1024

Figure 57 *Rx Control* window

- Set **AGC Mode** to **Algorithm**.
- Set **Channel** to **10700**.
- Set **AFC Algorithm** to **OFF** (Default = **OFF**).

Next action

When settings are ready, click **Start** to activate them.

If settings are changed later on (for example, you give a new channel number), you will need to click **Stop** and **Start** again.

Note: Clicking **Stop** also disables **Tx Control** if that was active!

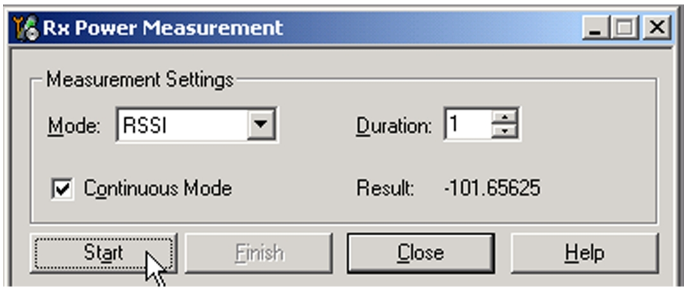
WCDMA RSSI measurement

Before you begin

WCDMA Rx must be activated before RSSI can be measured. See WCDMA Rx chain activation for manual measurement (page 7–10).

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Power Measurement** .
3. In the *Rx Power Measurement* window, choose the following settings:
    - Mode: RSSI
    - Continuous Mode



Mode: RSSI

Duration: 1

☑ Continuous Mode

Result: -101.65625

4. To perform the measurement, click **Start**.

Transmitter troubleshooting

General instructions for Tx troubleshooting

Context

- Tx troubleshooting requires Tx operation.
- Do not transmit on frequencies that are in use.
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The best diagnostic tool for GSM transmitter testing is **RF Controls**, and for the WCDMA transmitter testing **Tx Control**.

  Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a repair procedure.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software. The first section is for the EGSM900/GSM1800/GSM1900 bands and the latter for WCDMA.

> **Caution:** Never activate the GSM or WCDMA transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM or WCDMA PA may be damaged.

Steps

1. Connect a module jig to a computer with a DAU-9S cable or to a FPS-10 flash prommer with a modular cable.

   Make sure that you have a PKD-1 dongle connected to the computer parallel port.
2. Connect a DC power supply to a product-specific module jig.

   > **Note:** When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.
   >
   > Set the DC supply voltage to 3.9 V.
3. Connect an RF cable between the RF connector of the product-specific module test jig and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector; otherwise GSM or WCDMA PA may be damaged.

   > **Note:** There are three antenna connectors in the module jig:
   >
   > - one for GSM
   > - one for WCDMA
   > - one for Bluetooth and WLAN* (* = if applicable)
   >
   > Make sure that all connections are made to the correct RF connector.

   Normally a spectrum analyser is used as measurement equipment.

Note: The maximum input power of a spectrum analyser is +30 dBm.

To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.

4. Set Tx on.

   i Place the phone module to the test jig and start *Phoenix* service software.

   ii Initialize connection to the phone (with FPS-10 use FBUS when using a DAU-9S cable and a COMBOX driver).

   iii Choose **File→Open Product→xx-x*** (* = type designator of the phone) or **File→Scan Product.** .

   iv From the toolbar, set **Operating mode** to **Local.**

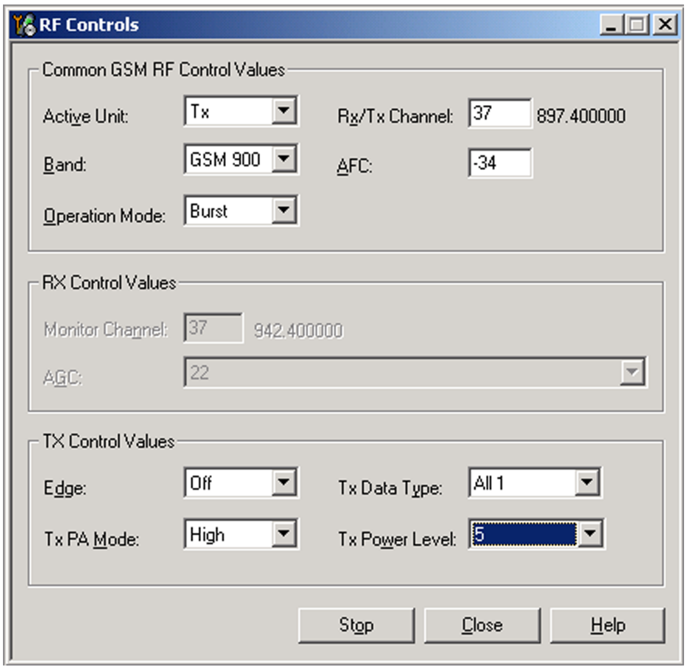
Alternative steps

- EGSM900/GSM1800/GSM1900 troubleshooting

  i Choose **Testing→GSM→RF Controls.**

  ii In the *RF Controls* window:

    - Choose **Band**: **GSM900** or **GSM1800** or **GSM1900** (Default = **GSM900**).
    - Set **Rx/Tx channel** in the following way:
      - GSM900: **37**
      - GSM1800: **700**
      - GSM1900: **661**
    - Set **Active unit** to **Tx** (Default = **Rx**).
    - Set **Operation Mode** to **Burst** (Default = **Burst**).
    - Set **Edge** to **Off** (Default).
    - Set **Tx Data Type** to **All 1** (Default = **All 1**).
    - Set **Tx PA Mode** to **High** (Default).
    - Set **Tx Power Level** in the following way:
      - GSM900: **5** (Default = **19**)
      - GSM1800: **0** (Default = **15**)
      - GSM1900: **0** (Default = **15**)



Common GSM RF Control Values

Active Unit: Tx
Band: GSM 900
Operation Mode: Burst
Rx/Tx Channel: 37 897.400000
AFC: -34

RX Control Values

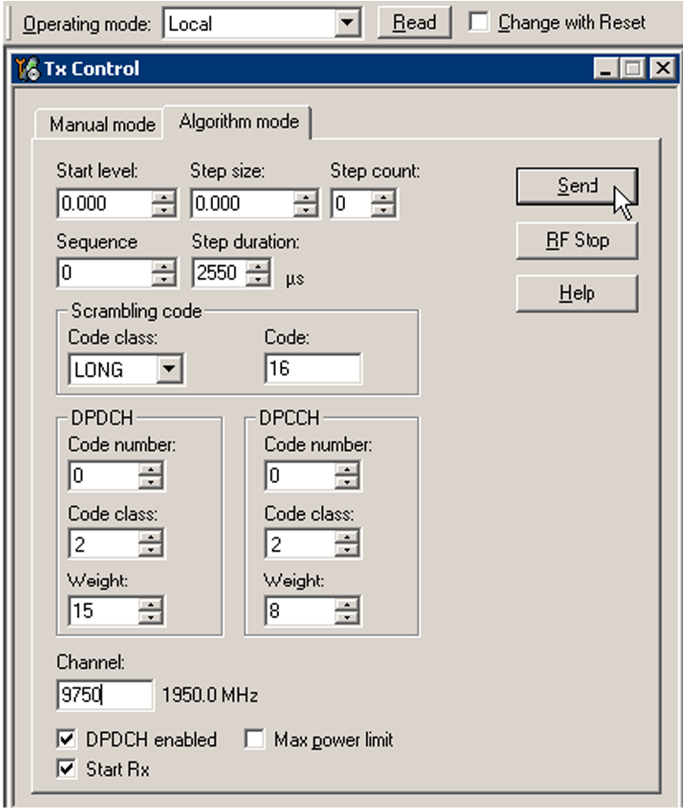
Monitor Channel: 37 942.400000
AGC: 22

TX Control Values

Edge: Off
Tx Data Type: All 1
Tx PA Mode: High
Tx Power Level: 5

Figure 58 *RF Controls* window

- WCDMA troubleshooting
  - i Choose **Testing→WCDMA→Tx Control.**
  - ii In the *Tx Control* window:
    - Select the **Algorithm mode** tab.
    - Set **Start level** to **0** dBm (Default = **0**).
    - Set **Step size**, **Step count** and **Sequence** to **0** (Default = **0**).
    - In the **Scrambling code** pane set **Code class** to **LONG** (Default = **LONG**), and **Code** to **16** (Default = **16**).
    - For **DPDCH** set the following values:
      - **Code number**: **0**
      - **Code class**: **2**
      - **Weight**: **15**
    - For **DPCCH** set the following values:
      - **Code number**: **0**
      - **Code class**: **2**
      - **Weight**: **8**
    - Set **Channel** to **9750**.
    - Check the **DPDCH enabled** check box (Default).



Operating mode: Local

☐ Change with Reset

Start level: 0.000
Step size: 0.000
Step count: 0
Sequence: 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code number: 0
Code class: 2
Weight: 15

DPCCH
Code number: 0
Code class: 2
Weight: 8

Channel: 9750 1950.0 MHz

☑ DPDCH enabled
☐ Max power limit
☑ Start Rx

Figure 59 ***Tx Control*** **window**

Next action

When settings are done, click **Send** to enable them.

If you change the settings (e.g. give a new channel number), you need to click **Stop** and **Send** again.

Checking antenna functionality

The main antenna has two separate antenna elements: GSM and WCDMA.

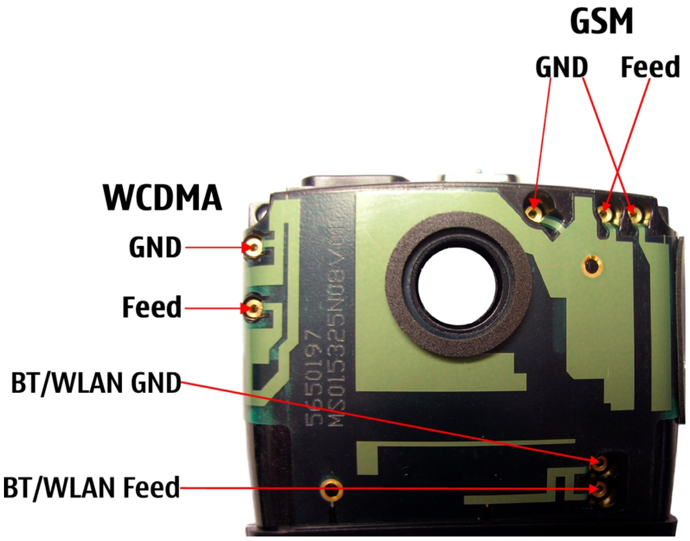
In the GSM antenna, there is one Feed and two GND contacts.

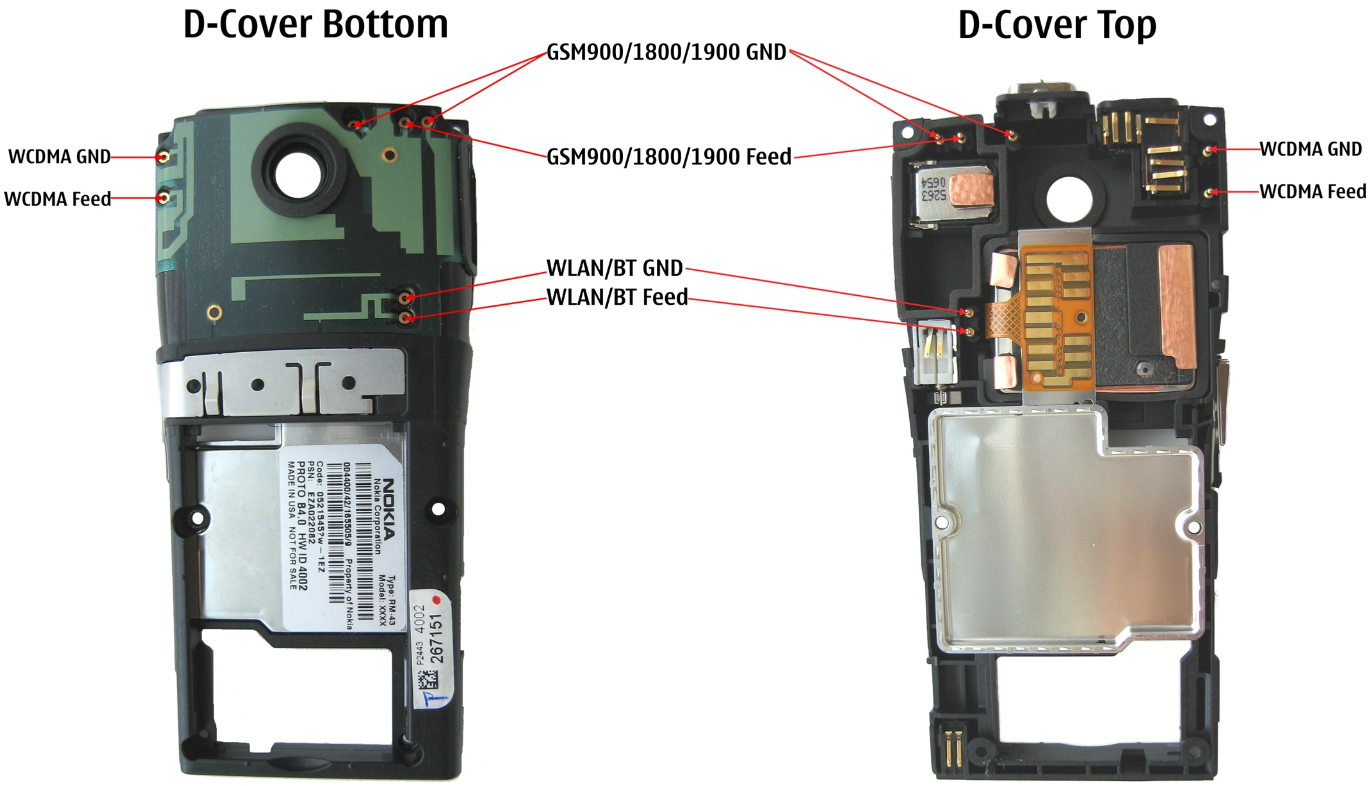
In the WCDMA antenna, there is one Feed and one GND contact.

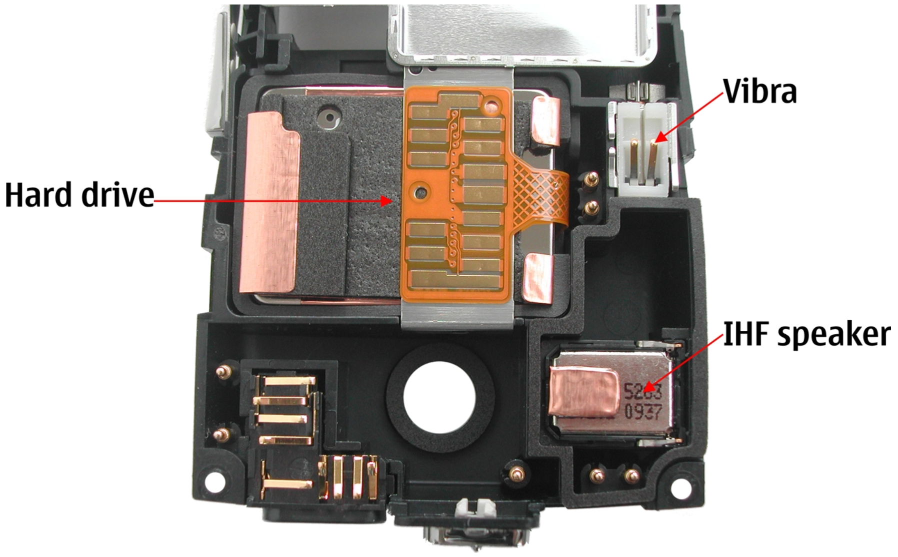
The contacts of the GSM antenna are separated in the (RDC = 0 ohm) short-circuit. The contacts of the WCDMA antenna are in the (RDC = 0 ohm) short-circuit.

The antenna is functioning normally when the contacts function (RDC = 0 ohm) and the antenna is visually intact.

Antenna Feed and GND spots


GSM
GND
Feed
WCDMA
GND
Feed
BT/WLAN GND
BT/WLAN Feed


D-Cover Bottom
D-Cover Top
GSM900/1800/1900 GND
WCDMA GND
WCDMA Feed
GSM900/1800/1900 Feed
WCDMA GND
WCDMA Feed
WLAN/BT GND
WLAN/BT Feed



BT antenna

BT antenna has one Feed and one GND contact. The antenna is functioning normally when the contacts function (RDC = 0 ohm) and the antenna is visually intact.

RF tunings

Introduction to RF tunings

Phone RF is tuned in production. There is no reason to do the re-calibration unless:

- one or more of the RF components is changed
- flash memory chip is changed or otherwise corrupted.

Caution: RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase results in a complete mistuning of the RF side.

Important: After RF component changes, always use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken in account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. For more detailed information, see section Service Tools and Service Concepts.

RF autotuning

Before you begin

For information on the recommended test set-up, refer to the corresponding information on the Partner Website or Nokia Online.

Before you can use the autotuning feature, the GPIB driver from the GPIB card vendor must be installed and running.

The autotune **.xml** file must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x*\rfconf_xx-x*.xml** (**= indicates the type designator of the phone, e.g. RM-1*)

Context

RF autotuning is performed with the aid of a digital radio communication tester.

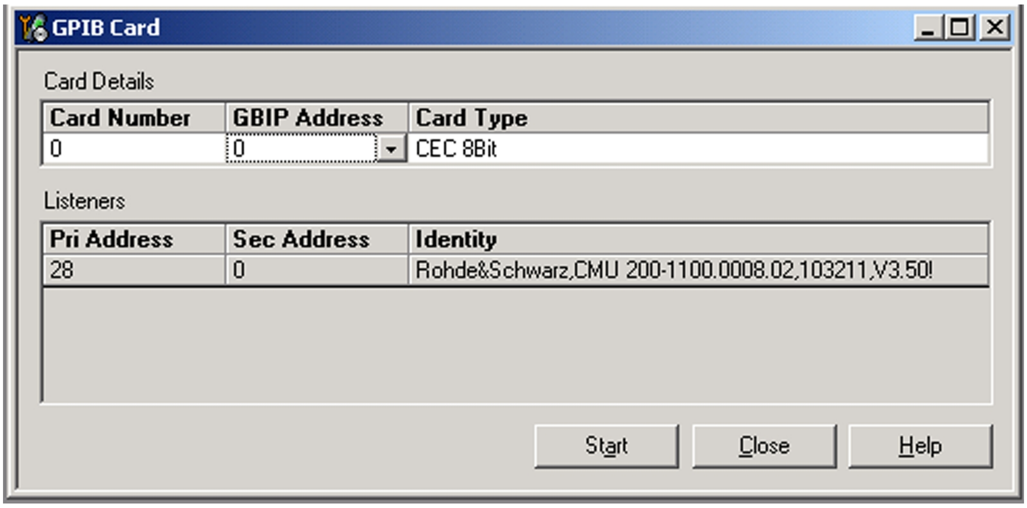
Autotuning covers all RF tunings that are needed to perform after RF component repairs.

> **Note:** Do not perform RF autotuning without a proper reason. Autotuning may only be performed after component repairs or if the RF tuning information is lost.

Steps

1. Connect the communication tester to the GPIB bus.
2. Start *Phoenix* service software.
3. Choose **Tools→Options→GPIB Card.**
4. From the **Card Type** drop-down menu, choose the GPIB card used, then click **Start**.

   The name of the communication tester appears in the **Listeners** pane.



Card Details

Card Number	GBIP Address	Card Type
0	0	CEC 8Bit

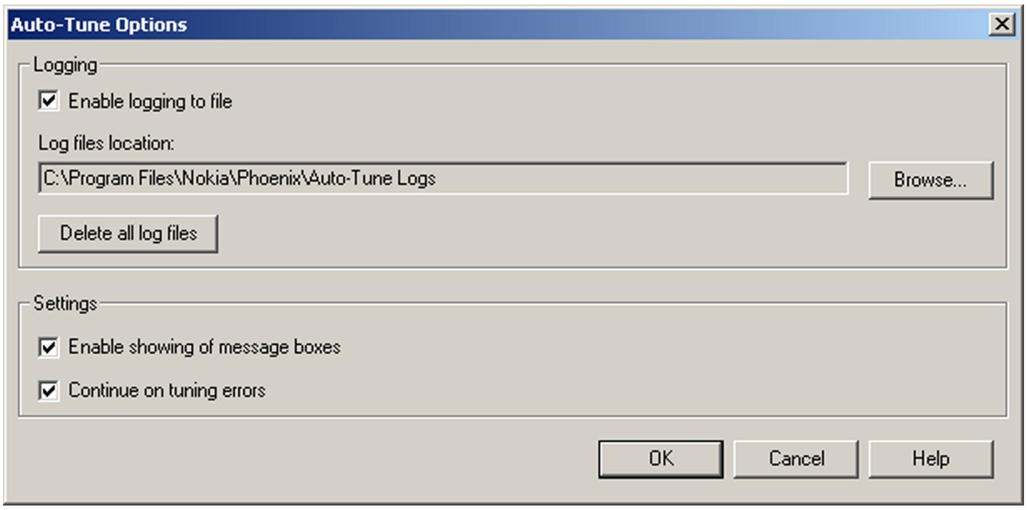
Listeners

Pri Address	Sec Address	Identity
28	0	Rohde&Schwarz,CMU 200-1100.0008.02,103211,V3.50!

5. To specify the cable loss from a module jig to the communication tester, choose **Set Loss** from the **Tuning** menu.
6. In the *Set Loss* window, click the **Jig** tab, and select the right jig for the phone from the drop-down list.

   Alternatively, you can add a new jig by clicking **Add**, and selecting the desired jig from the list.
7. Click the **Cable** tab and add the extra cable attenuation.
8. To start autotuning, choose **Auto-Tune** from the **Tuning** menu.
9. In the *Auto-Tune* window, click **Options**.

10. In the *Auto-Tune options* window, ensure the **Enable showing of message boxes** check box is checked, and click **OK**.



Auto-Tune Options

Logging

☑ Enable logging to file

Log files location:

C:\Program Files\Nokia\Phoenix\Auto-Tune Logs

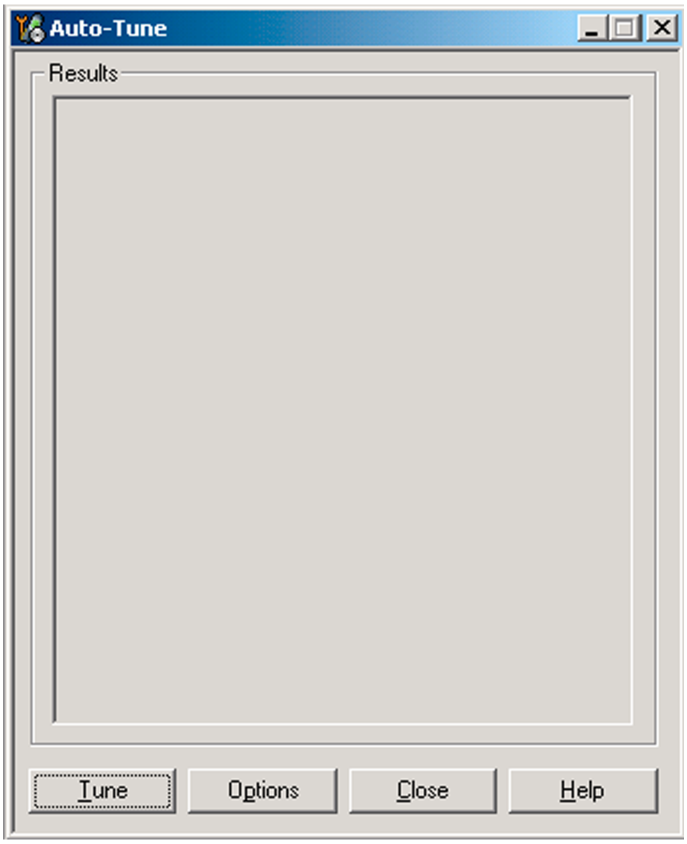
Settings

☑ Enable showing of message boxes

☑ Continue on tuning errors

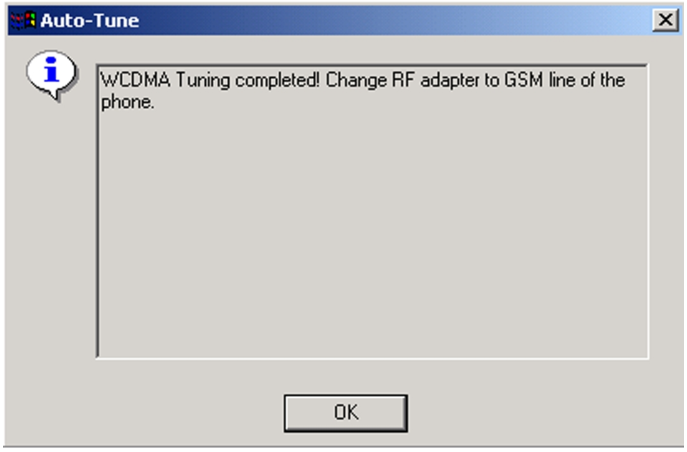
Browse...
Delete all log files
OK
Cancel
Help

11. Connect the phone WCDMA RF port to the communication tester, and click **Tune**.



Auto-Tune
Results
Tune
Options
Close
Help

12. Change the phone RF adapter from WCDMA port to GSM port.

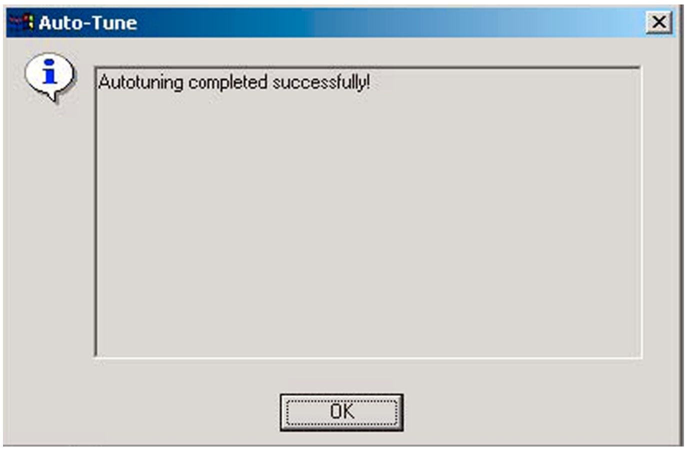


WCDMA Tuning completed! Change RF adapter to GSM line of the phone.

13. To complete the RF autotuning, click **OK**.

Results

Autotuning completed successfully! message appears.



Autotuning completed successfully!

RF manual tuning guide

Required manual tunings after component changes

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

If, however, manual tuning is used, only relevant tunings should be performed. Refer to the following table:

Changed component	Perform the following tunings
Any component in the GSM Tx RF chain before the PA	Tx IQ Tuning, Tx Power Level Tuning
Any component in the GSM Tx RF chain after the PA or PA	Tx Power Level Tuning
Any component in the WCDMA Tx or Rx chain after the PA, power detector or PA switch mode power supply	Tx AGC & Power Detector, Tx Band Response Calibration, PA Detection

Changed component	Perform the following tunings
Any component in the GSM Rx chain	Rx Calibration, RX Band Filter Response Compensation, RX AM Suppression
Any component in the WCDMA Rx chain	Rx AGC Alignment, RX Band Response Calibration

System mode independent manual tunings

Rf channel filter calibration

Context

Rf channel filter calibration tunes the internal low pass filters of Rx and Tx ASICs that limit the bandwidth of BB IQ signals.

One common calibration is made for both GSM and WCDMA.

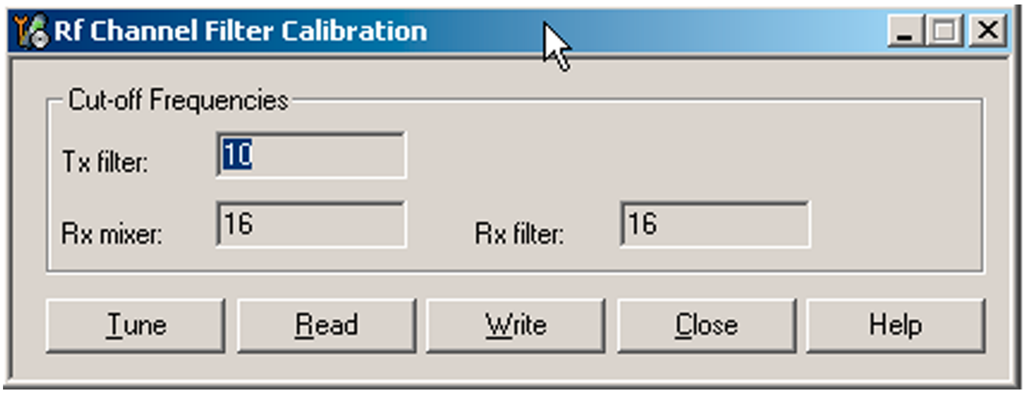
Table 15 Rf channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
Rx filter	0	16	31

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Rf Channel Filter Calibration.**
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To end the tuning, click **Close**.

Results



Tx filter: 10

Rx mixer: 16

Rx filter: 16

Figure 60 Rf channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.
4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

Temperature sensor calibration

Context

There is a temperature sensor integrated into one of the device ASICs. The ASIC provides DC-voltage, which is temperature dependent.

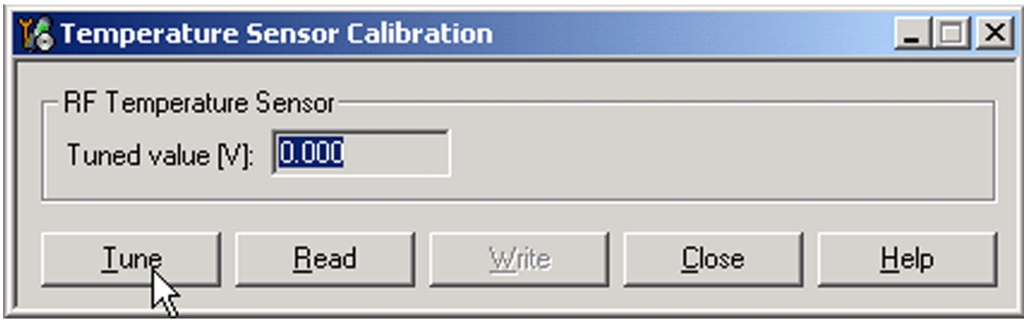
Temperature sensor calibration is done in room temperature, in which offset caused by the ASIC variation and AD-converter are nullified.

The module is able to do this calibration by itself, no external equipment is needed.

The temperature of the module and components must be 23 +/-2 degrees.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Temperature Sensor Calibration** .
3. Click **Tune**.



Tuned value [V]: 0.000

Table 16 Temperature sensor calibration tuning limits

Min	Typ	Max	Unit
-20	-4	20	V

4. To save the calibration values, click **Write**.
5. To finish the calibration, click **Close**.

GSM receiver tunings

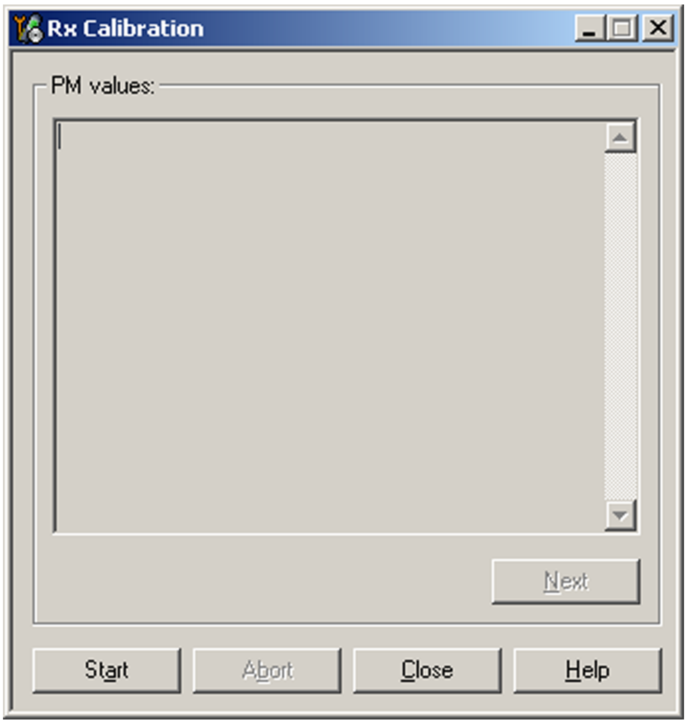
Rx calibration (GSM)

Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

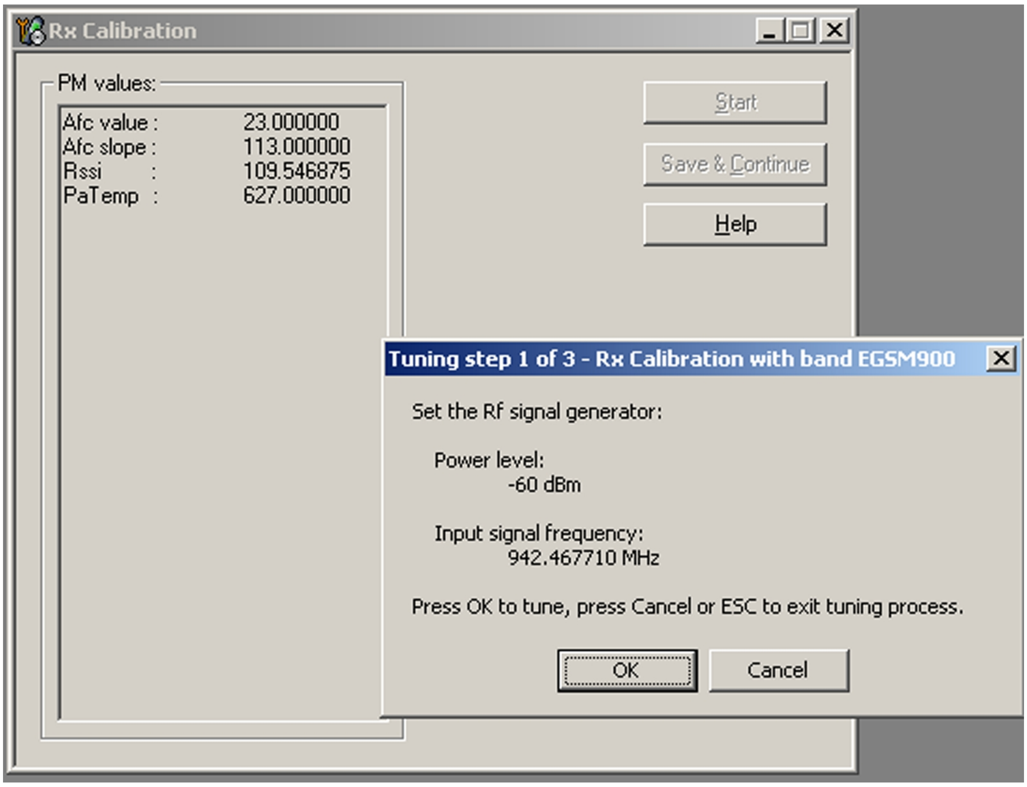
Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. Choose **File→Scan Product.**
4. From the **Operating mode** drop-down menu, set mode to **Local**.
5. Choose **Tuning→GSM→Rx Calibration.**
6. Click **Start**.



7. Connect the signal generator to the phone and set frequency and amplitude as instructed in the *Tuning step 1 of 3 - Rx Calibration with band EGSM900* pop-up window.

   Note: The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation!



PM values:

Afc value : 23.000000
Afc slope : 113.000000
Rssi : 109.546875
PaTemp : 627.000000

Tuning step 1 of 3 - Rx Calibration with band EGSM900

Set the Rf signal generator:

Power level:
-60 dBm

Input signal frequency:
942.467710 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

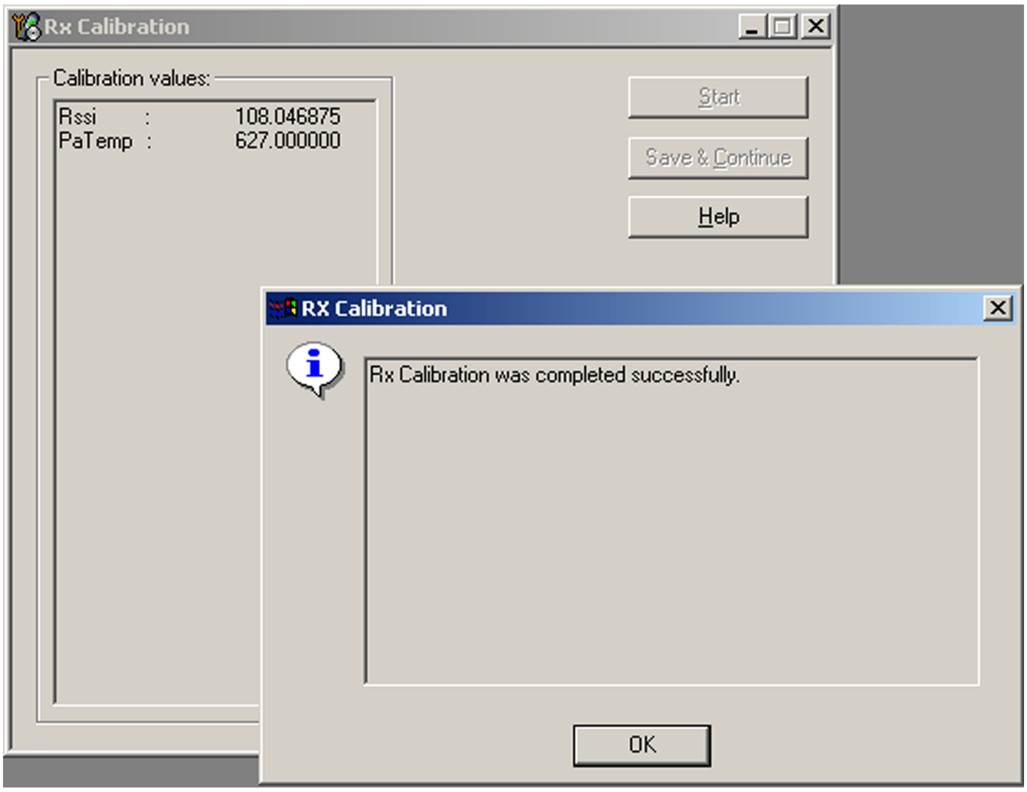
8. To perform the tuning, click **OK**.
9. Check that the tuning values are within the limits specified in the following table:

Table 17 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM900				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM1800				
RSSI0	104	104...109	114	dB
GSM1900				
RSSI0	104	104...109	114	dB

10. When the first values have been written to the phone memory, click **Next** to change to the next band.
11. To finish the tuning, go through all bands, and click **Close**.

Results



Rssi : 108.046875
PaTemp : 627.000000

Rx Calibration was completed successfully.

Rx band filter response compensation (GSM)

Before you begin

Rx Calibration must be performed before the Rx Band Filter Response Compensation.

Context

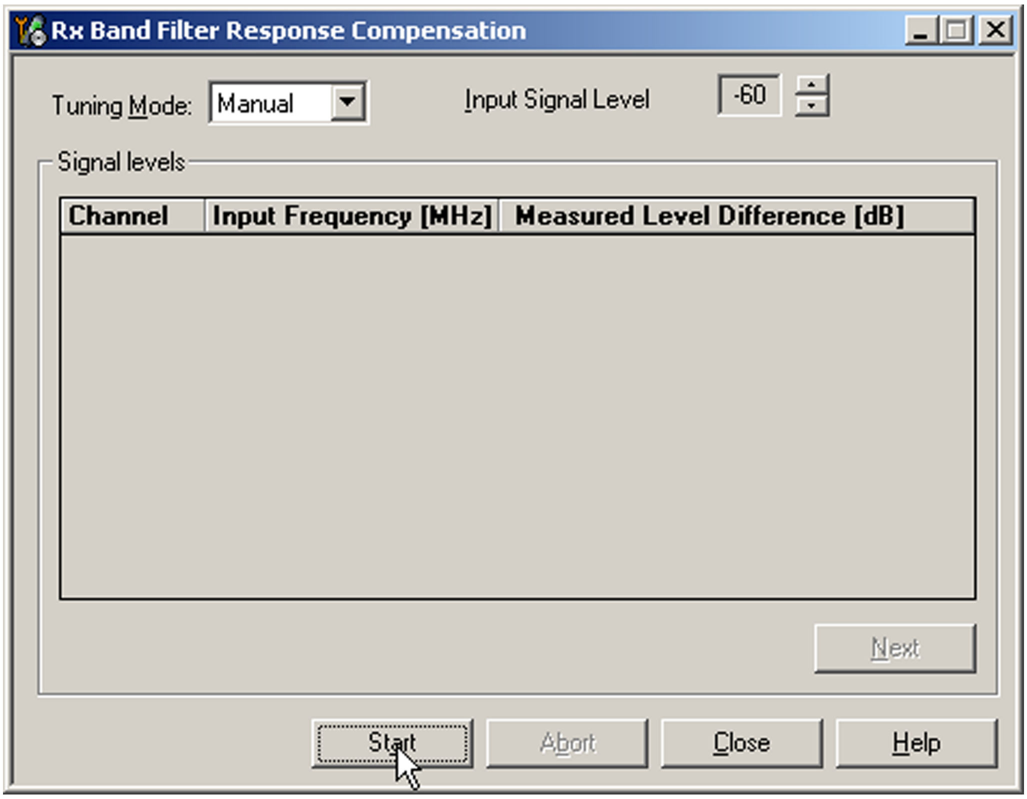
On each GSM Rx band, there is a band rejecting filter in front of an RF ASIC front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. Choose **File Scan Product**.
4. From the **Operating mode** drop-down menu, set mode to **Local**.
5. Select **GSM900** band.
6. Choose **Tuning→GSM→Rx Band Filter Response Compensation.**
7. From the *Tuning mode* drop-down menu, select **Manual**.

8. Click **Start**.



Rx Band Filter Response Compensation

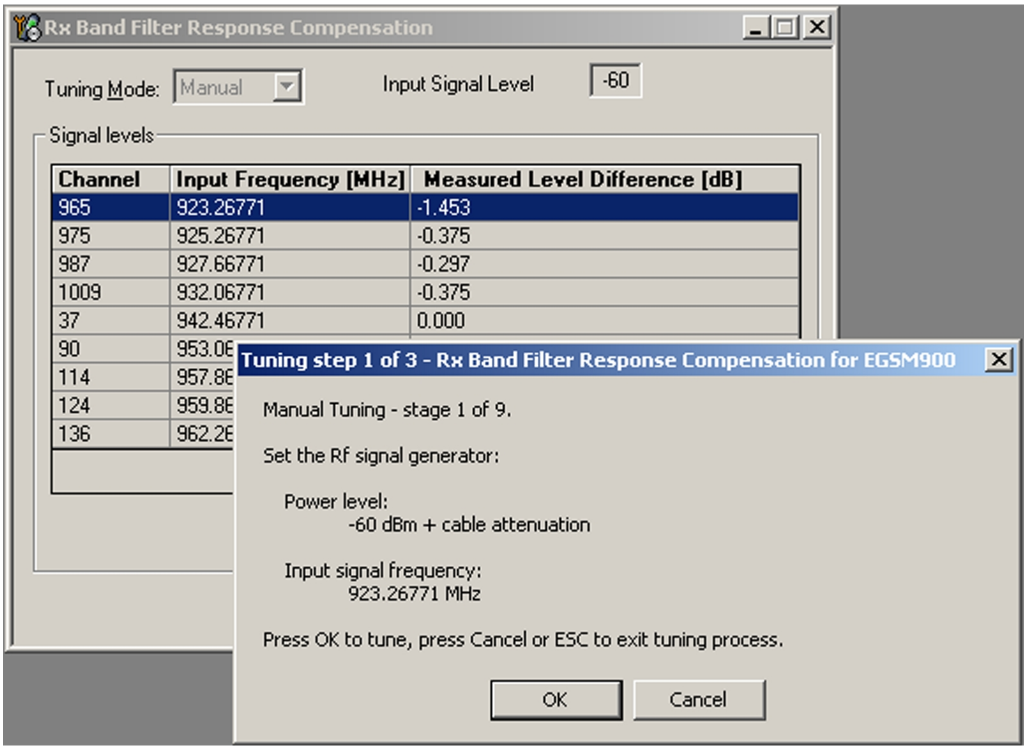
Tuning Mode: Manual

Input Signal Level -60

Signal levels

Channel	Input Frequency [MHz]	Measured Level Difference [dB]

9. Connect the signal generator to the phone and set frequency and amplitude as instructed in the *Tuning step 1 of 3 - Rx Band Filter Response Compensation for EGSM900* pop-up window.



Rx Band Filter Response Compensation

Tuning Mode: Manual

Input Signal Level -60

Signal levels

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-1.453
975	925.26771	-0.375
987	927.66771	-0.297
1009	932.06771	-0.375
37	942.46771	0.000
90	953.0	
114	957.8	
124	959.8	
136	962.2	

Tuning step 1 of 3 - Rx Band Filter Response Compensation for EGSM900

Manual Tuning - stage 1 of 9.

Set the Rf signal generator:

Power level:
-60 dBm + cable attenuation

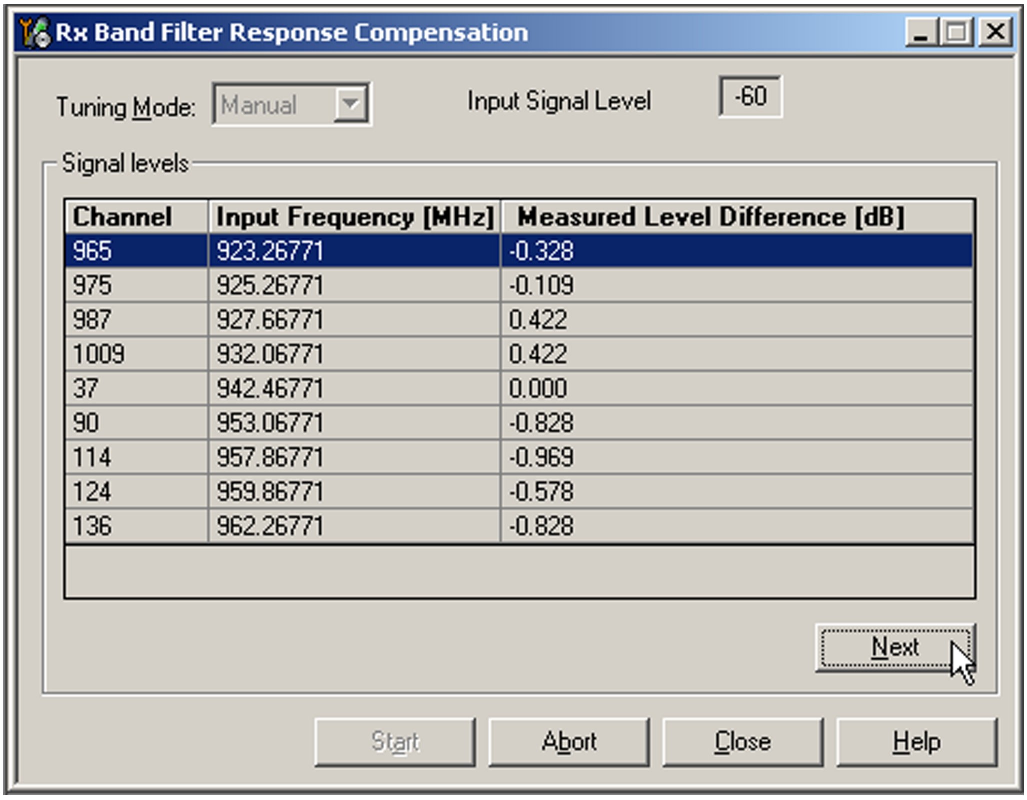
Input signal frequency:
923.26771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

10. To perform the tuning, click **OK**.

11. Go through all 9 frequencies.

    The following window appears, showing signal levels for the input frequencies:



Tuning Mode: Manual

Input Signal Level -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-0.328
975	925.26771	-0.109
987	927.66771	0.422
1009	932.06771	0.422
37	942.46771	0.000
90	953.06771	-0.828
114	957.86771	-0.969
124	959.86771	-0.578
136	962.26771	-0.828

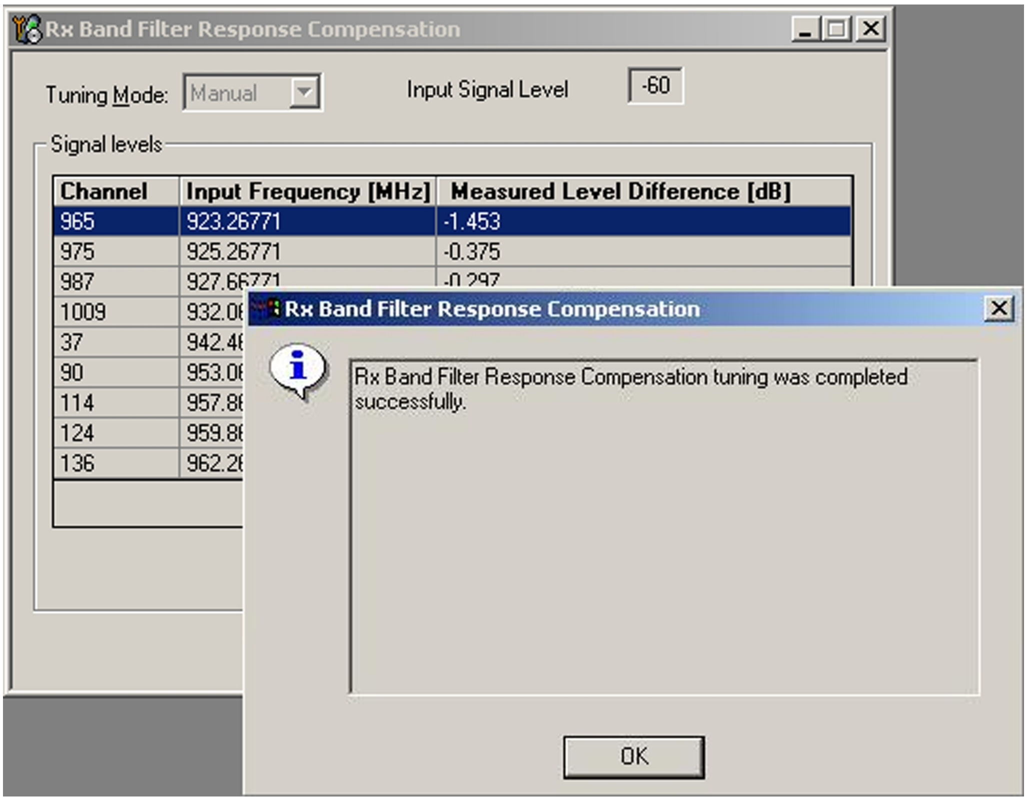
12. Check that the tuning values are within the limits specified in the following table:

	Min	Typ	Max	Unit
GSM900				
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB
Ch. 136 / 962.26771 MHz	-10	-1	5	dB
GSM1800				
Ch. 497 / 1802.26771 MHz	-10	-1	5	dB
Ch. 512 / 1805.26771 MHz	-3	0	5	dB
Ch. 535 / 1809.86771 MHz	-3	0	5	dB
Ch. 606 / 1824.06771 MHz	-3	0	5	dB

	Min	Typ	Max	Unit
Ch. 700 / 1842.86771 MHz	-3	0	5	dB
Ch. 791 / 1861.06771 MHz	-3	0	5	dB
Ch. 870 / 1876.86771 MHz	-3	0	5	dB
Ch. 885 / 1879.86771 MHz	-3	0	5	dB
Ch. 908 / 1884.46771 MHz	-10	-1	5	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-10	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-10	-1	5	dB

13. If the values are within the limits, click **Next** to continue with the next band.
14. Go through all bands, and click **Close** to end the tuning.

Results


Rx Band Filter Response Compensation
Signal levels
Rx Band Filter Response Compensation
OK

Tuning Mode: Manual

Input Signal Level -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-1.453
975	925.26771	-0.375
987	927.66771	-0.297
1009	932.0	
37	942.4	
90	953.0	
114	957.8	
124	959.8	
136	962.2	

Rx Band Filter Response Compensation tuning was completed successfully.

Rx AM suppression (GSM)

Context

Rx AM suppression is used to tune the AM suppression capabilities of the GSM receiver.

AM suppression is related to the ability of the receiver to operate when there is a disturbing AM modulated signal near the received channel signal frequency.

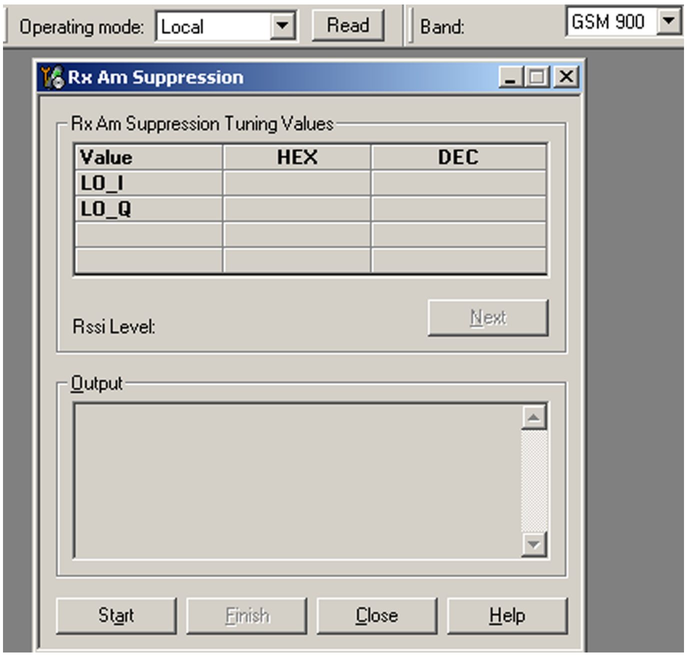
RFIC has a tunable compensation circuit which has an effect on the AM suppression ability.

In Rx AM suppression, a continuous signal accompanied with an AM modulated signal 10 MHz above the current channel is feed to the antenna. RFIC control word values are iterated until a minimum RSSI signal is found.

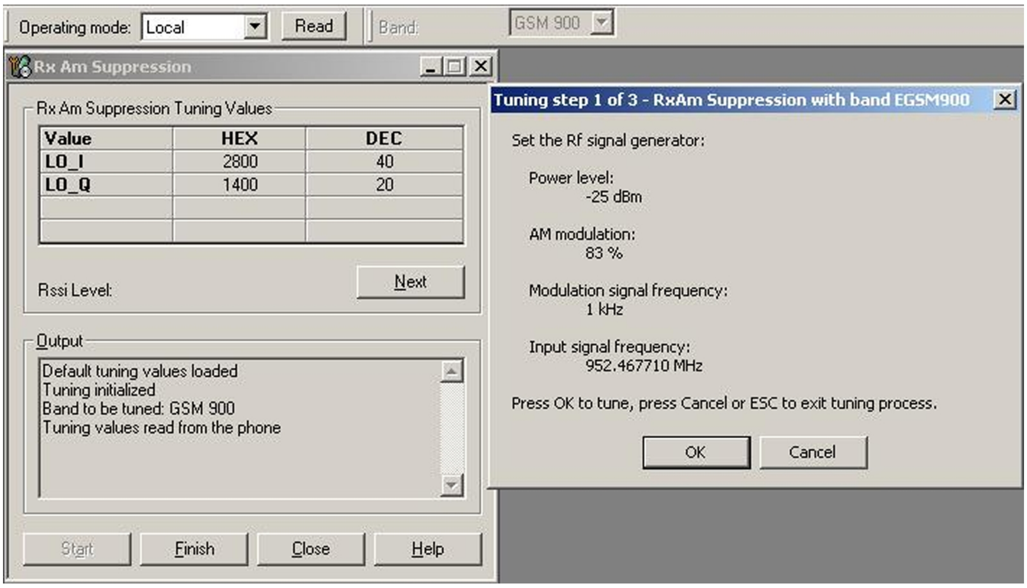
Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. Choose **File→Scan Product.**
4. From the drop-down menus, set **Operating mode** to **Local**, and select the **GSM900** band.
5. Choose **Tuning→GSM→Rx AM Suppression.**

6. Click **Start**.


Operating mode:
Local
Read
Band:
GSM 900
Rx Am Suppression
Rx Am Suppression Tuning Values
Value
HEX
DEC
LO_I
LO_Q
Rssi Level:
Next
Output
Start
Finish
Close
Help

7. Connect the signal generator to the phone according to the frequency and modulation parameters displayed in the pop-up window:


Operating mode:
Local
Read
Band:
GSM 900
Rx Am Suppression
Rx Am Suppression Tuning Values
Rssi Level:
Next
Output
Start
Finish
Close
Help
OK
Cancel

Value	HEX	DEC
LO_I	2800	40
LO_Q	1400	20

Default tuning values loaded
Tuning initialized
Band to be tuned: GSM 900
Tuning values read from the phone

Tuning step 1 of 3 - RxAm Suppression with band EGSM900

Set the Rf signal generator:

Power level:
-25 dBm

AM modulation:
83 %

Modulation signal frequency:
1 kHz

Input signal frequency:
952.467710 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

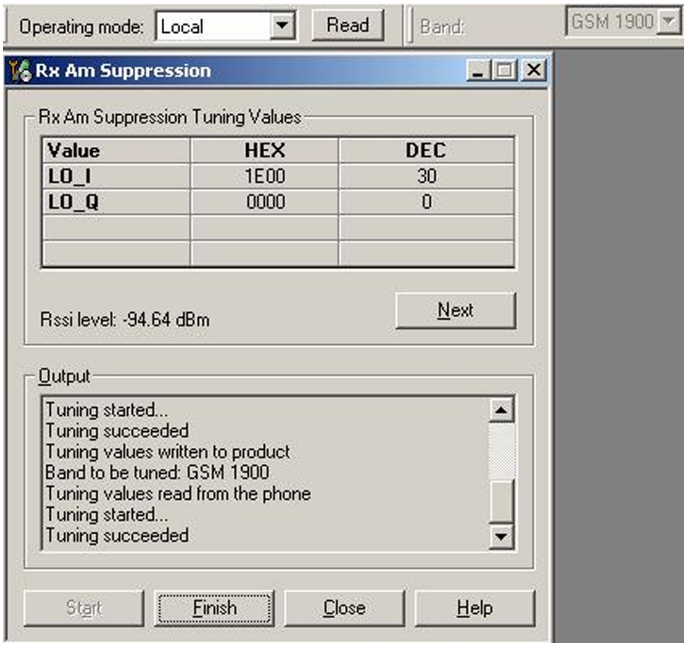
8. Click **OK**.

9. Check that RSSI level value is between the limits presented in the following table.

Table 18 RSSI level values

Band	Min	Max	Unit
GSM900	-115	-90	dB
GSM1800	-115	-85	dB
GSM1900	-115	-100	dB

10. To proceed to the next band, click **Next**.
11. Go through all bands.
12. To end the tuning, click **Finish** and **Close**.



Operating mode: Local

Band: GSM 1900

Value	HEX	DEC
LO_I	1E00	30
LO_Q	0000	0

Rssi level: -94.64 dBm

```
Tuning started...
Tuning succeeded
Tuning values written to product
Band to be tuned: GSM 1900
Tuning values read from the phone
Tuning started...
Tuning succeeded
```

GSM transmitter tunings

Tx IQ tuning (GSM)

Context

- The Tx path branches to I and Q signals at the RF I/Q modulator. Modulator and analog hardware located after the modulator cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning balances the I and Q branches.
- Tx IQ tuning must be performed on all GSM bands.

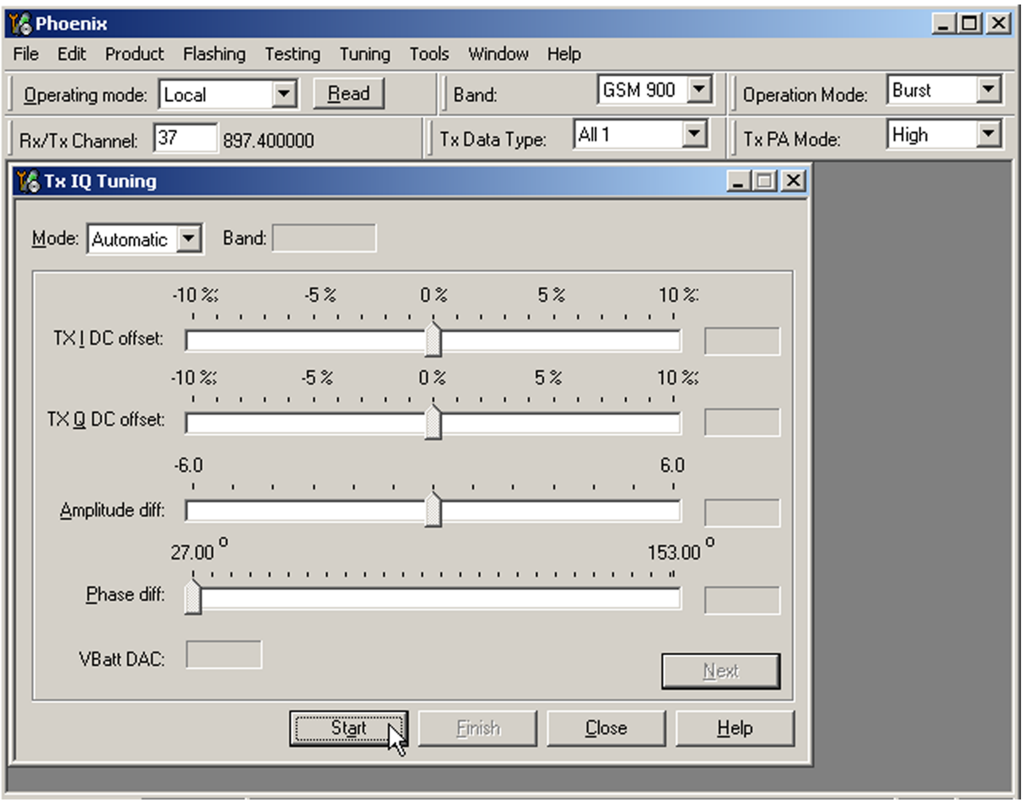
Steps

1. Start *Phoenix* service software.
2. Choose **File→Scan Product.**
3. From the **Operating mode** drop-down menu, set mode to **Local.**
4. Choose **Tuning→GSM→Tx IQ Tuning.**
5. From the **Band** drop-down menu, choose **GSM900**.
6. In the *Tx IQ Tuning* window, set mode to **Automatic**.
7. Click **Start**.

   Wait until the automatic tuning feature has finished and moved the sliders.

   Values are written to the phone memory automatically.

   Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the following table.

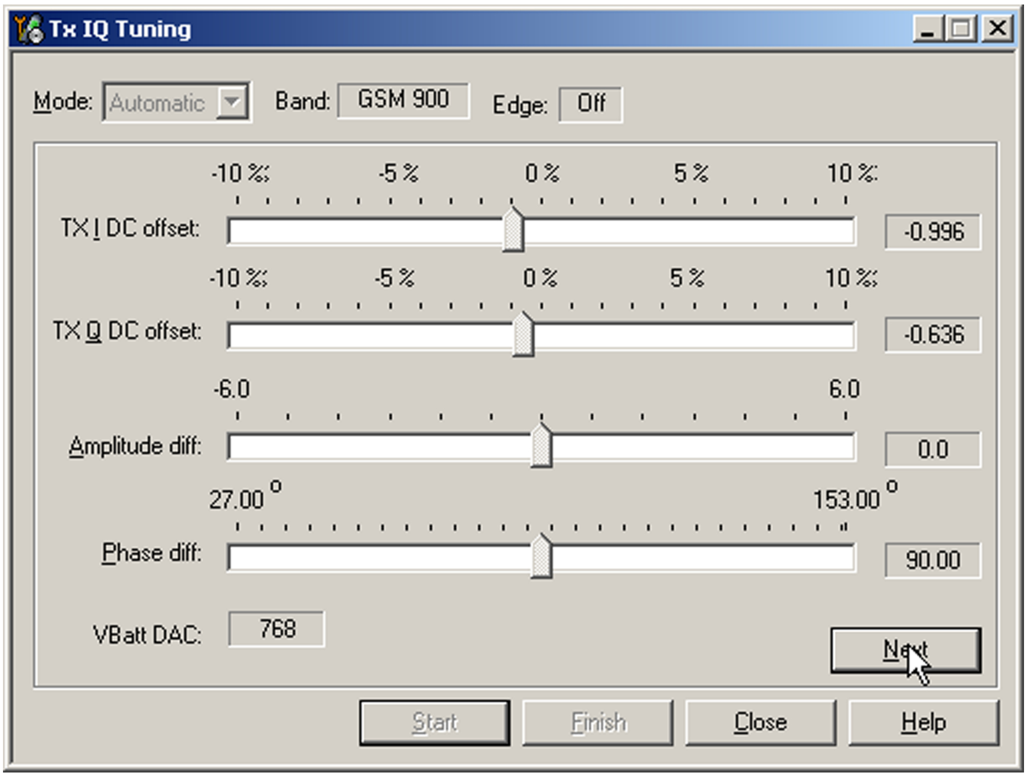

Phoenix
File Edit Product Flashing Testing Tuning Tools Window Help
Read
Tx IQ Tuning
Band:
-10 % -5 % 0 % 5 % 10 %
TX I DC offset:
-10 % -5 % 0 % 5 % 10 %
TX Q DC offset:
-6.0 6.0
Amplitude diff:
27.00 ° 153.00 °
Phase diff:
VBatt DAC:
Next
Start
Finish
Close
Help

Operating mode: Local
Band: GSM 900
Operation Mode: Burst
Rx/Tx Channel: 37 897.400000
Tx Data Type: All 1
Tx PA Mode: High
Mode: Automatic

Table 19 Tx IQ tuning limits

	Min	Typ	Max	Unit
GSM900				
I DC offset / Q DC offset	-6	-4/4	6	dB
Ampl	-1	0	1	dB
Phase	85	90	95	dB
GSM1800/GSM1900				
I/Q DC	-6	-0.5/0.5	6	dB
Ampl	-1	0	1	dB
Phase	95	100	110	dB

8. When the first values have been written to the phone memory, click **Next** to continue to the next band.



Mode: Automatic
Band: GSM 900
Edge: Off
TX I DC offset: -0.996
TX Q DC offset: -0.636
Amplitude diff: 0.0
Phase diff: 90.00
VBatt DAC: 768

9. Go through all bands.
10. When all bands have been tuned, click **Finish**, and **Close** to end the tuning procedure.

Next action

If the tuning values are not within the limits specified in the "Tx IQ tuning limits" table, start the procedure again, and check the Tx IQ quality manually.

Tx power level tuning (GSM)

Context

Because of variations in the integrated circuit process and discrete component values, the actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

In dual or triple band phones, the power level tuning is made for both high and low PA Modes (Power Amplifier Mode) in the GSM900 band but only for high PA mode in GSM1800/GSM1900 bands

For EDGE transmission, the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and therefore the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. Start *Phoenix* service software.
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→GSM→Tx Power Level Tuning.**

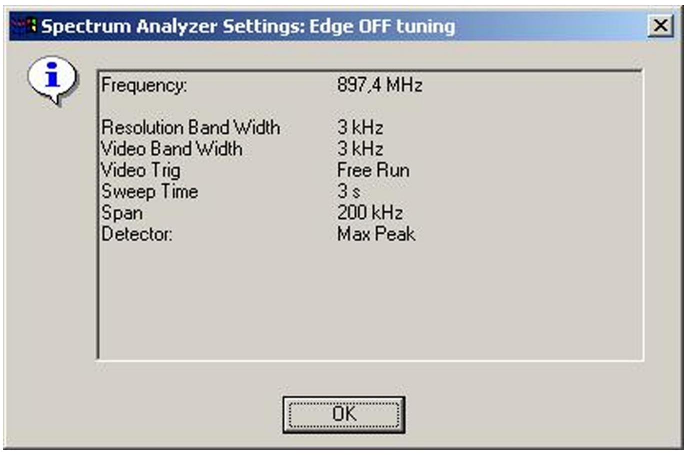
5. Click **Start**.

   The current coefficients saved in the permanent memory (PM) of the terminal are shown.

6. Set the spectrum analyzer for power level tuning:

Frequency	channel frequency (897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	200 kHz
Sweep time	3s
Trigger	Video triggering: Free run
Resolution BW	3 kHz
Video BW	3 kHz
Reference level offset	sum cable attenuation with module jig attenuation
Reference level	33dBm

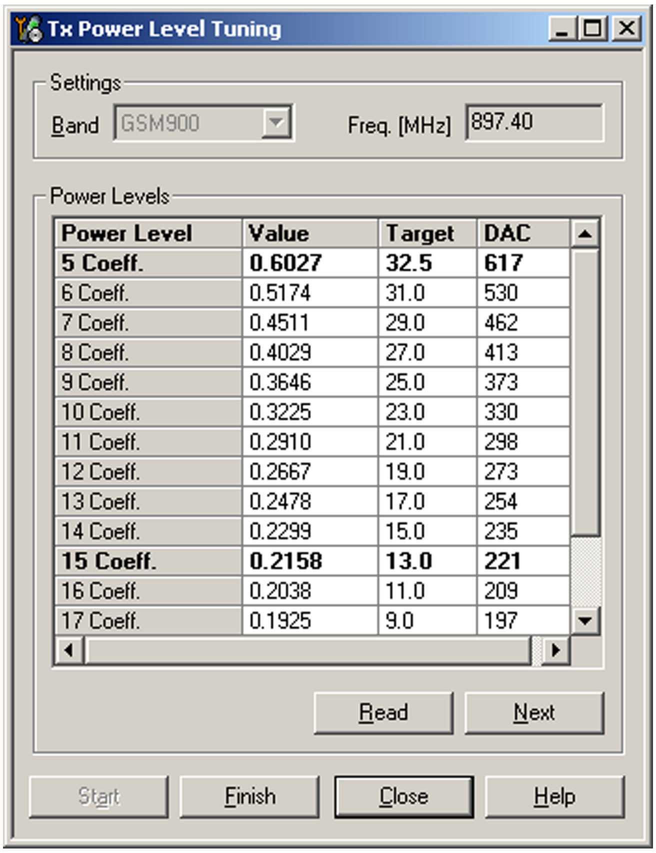
A power meter with a peak power detector can be also used. Remember to take the attenuations into account!



Frequency: 897,4 MHz

Resolution Band Width 3 kHz
Video Band Width 3 kHz
Video Trig Free Run
Sweep Time 3 s
Span 200 kHz
Detector: Max Peak

7. Adjust power levels **5**, **15** and **19** to correspond the *Target dBm* column by pressing + or – keys.



Settings

Band: GSM900   Freq. [MHz]: 897.40

Power Levels

Power Level	Value	Target	DAC
5 Coeff.	**0.6027**	**32.5**	**617**
6 Coeff.	0.5174	31.0	530
7 Coeff.	0.4511	29.0	462
8 Coeff.	0.4029	27.0	413
9 Coeff.	0.3646	25.0	373
10 Coeff.	0.3225	23.0	330
11 Coeff.	0.2910	21.0	298
12 Coeff.	0.2667	19.0	273
13 Coeff.	0.2478	17.0	254
14 Coeff.	0.2299	15.0	235
15 Coeff.	**0.2158**	**13.0**	**221**
16 Coeff.	0.2038	11.0	209
17 Coeff.	0.1925	9.0	197

Check that the coefficient values are within the limits specified in the following table.

	Min	Typ	Max
GSM900 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM900 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.51	0.7
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.394	0.6
PL11 coefficient		0.23	

	Min	Typ	Max
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			
PL0 coefficient	0.45	0.482	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.377	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

8. If the values are within the limits, click **Next** to proceed to the next band, and click **Start**.
9. Set **Edge** mode on and start tuning again. Change video averaging to 50.
10. Tune EDGE power levels to the corresponding target power levels.

    Only power levels **8**, **15** and **19** are tuned in GSM900, and **2**, **10** and **15** in GSM1800/1900.
11. When the tuning is completed, close the *Tx Power Level Tuning* window.

WCDMA receiver tunings

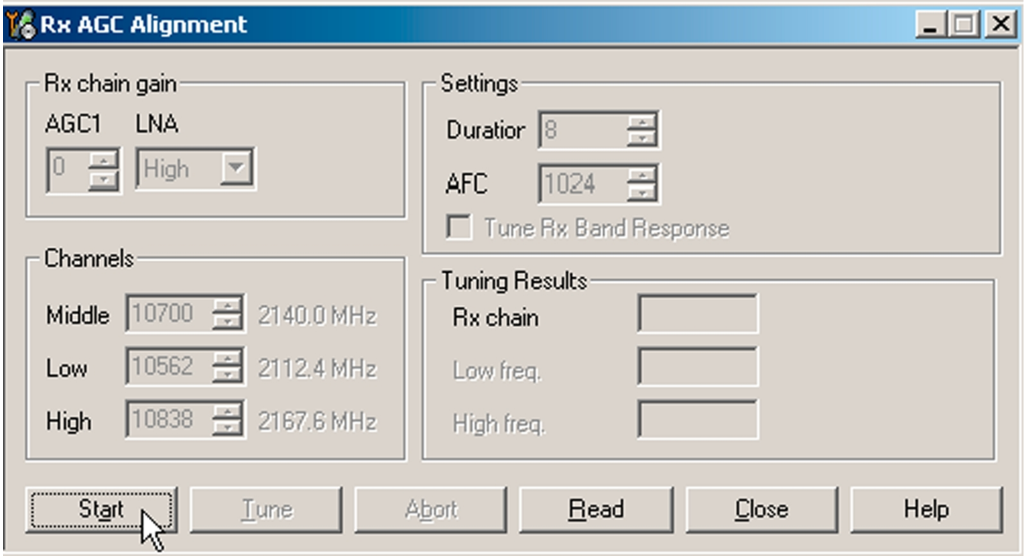
Rx AGC alignment (WCDMA)

Context

Rx AGC alignment tuning is used to find out the real gain values of the WCDMA Rx AGC system and converters.

Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. From the **Operating mode** drop-down menu, set mode to **Local**.
3. Choose **Tuning→WCDMA→Rx AGC Alignment** .
4. Click **Start** and **Tune**.



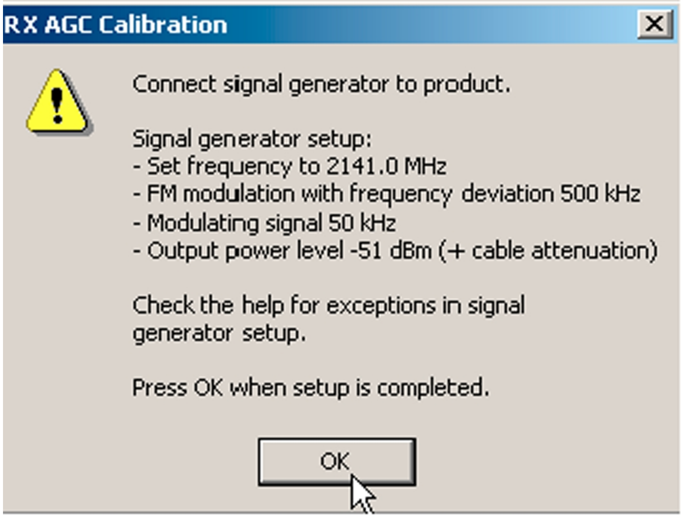
Rx chain gain
AGC1: 0
LNA: High

Settings
Duration: 8
AFC: 1024
☐ Tune Rx Band Response

Channels
Middle: 10700 2140.0 MHz
Low: 10562 2112.4 MHz
High: 10838 2167.6 MHz

Tuning Results
Rx chain
Low freq.
High freq.

5. Setup the signal generator to correspond the values in the *RX AGC Calibration* pop-up window and click **OK**.



Connect signal generator to product.

Signal generator setup:
- Set frequency to 2141.0 MHz
- FM modulation with frequency deviation 500 kHz
- Modulating signal 50 kHz
- Output power level -51 dBm (+ cable attenuation)

Check the help for exceptions in signal generator setup.

Press OK when setup is completed.

Frequency:	2141MHz
Level:	–51 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

6. Check that the *Rx chain* value in *Tuning Results* is within the limits presented in the following table.

	Min	Typ	Max	Unit
RX chain	-6	1.5... 3.5	6	dB
Low freq	-5	-0.7... 4.0	5	
High freq	-5	-0.7... 4.0	5	

i If the Rx gain is acceptable, click **Yes** to save the results to the phone.

7. To close the *Rx AGC Alignment* window, click **Close**.

Rx band response calibration (WCDMA)

Context

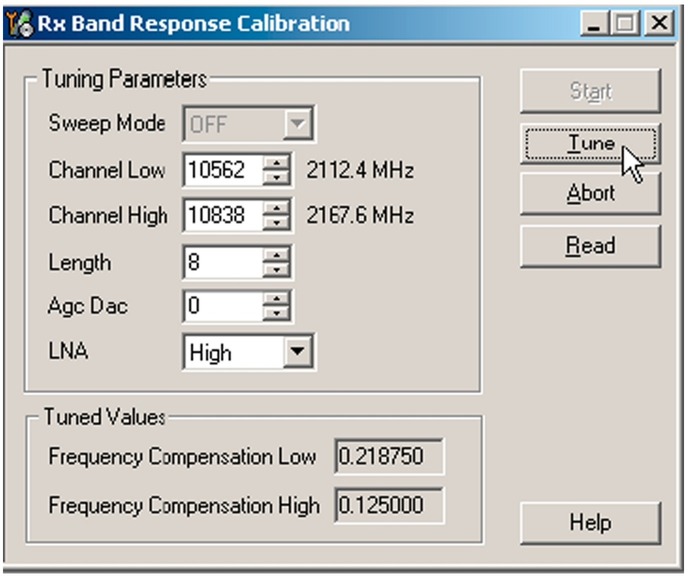
There is a band rejecting filter for each WCDMA Rx band between the front end LNA and the mixer of an RF ASIC. The amplitude ripple caused by this filter causes ripple to the RSSI measurement and therefore Rx band response calibration is needed.

The Rx band response calibration can be done in two different ways. If the signal generator used supports frequency sweep table, the calibration can be done as a part of the Rx calibration. If there is no support for the frequency sweep table , it is possible to calibrate all necessary frequencies one by one.

The first set of steps shows how to perform the calibration without the signal generator sweep feature. The alternative steps give instructions how to perform the calibration if the signal generator supports frequency sweeps, and the calibration can be performed within the Rx AGC calibration.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→Rx Band Response Calibration.**
3. Click **Start** and **Tune**.



Sweep Mode: OFF
Channel Low: 10562 2112.4 MHz
Channel High: 10838 2167.6 MHz
Length: 8
Agc Dac: 0
LNA: High
Frequency Compensation Low: 0.218750
Frequency Compensation High: 0.125000

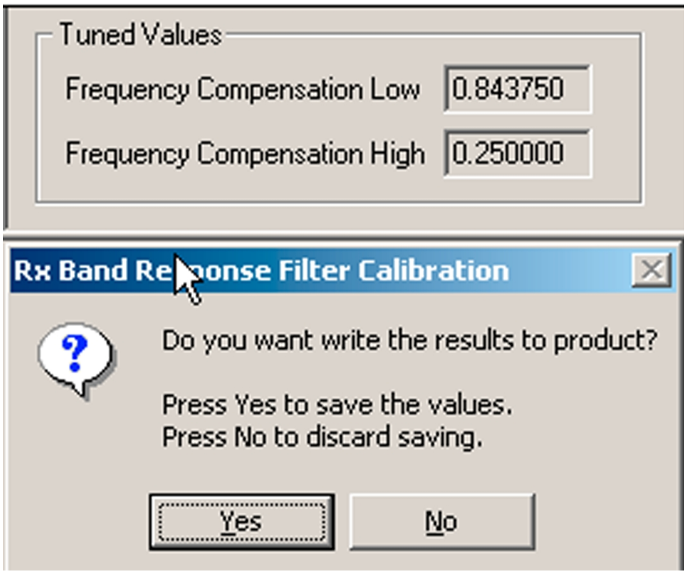
4. Setup the signal generator to correspond the values in the pop-up window:

Frequency:	2113.4 MHz
Level:	–48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

5. Click **OK**.
6. Change frequency to *2166.6* MHz and click **OK**.
7. Check that the tuned values are within the limits specified in the following table :

	Min	Max
Frequency compensation low	-5	+5
Frequency compensation high	-5	+5

i If the values are OK, click **Yes** to save the values.



Tuned Values

Frequency Compensation Low: 0.843750

Frequency Compensation High: 0.250000

Rx Band Response Filter Calibration

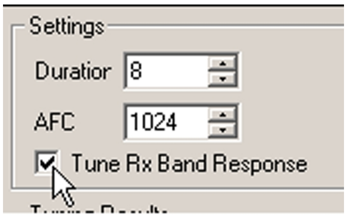
Do you want write the results to product?

Press Yes to save the values.
Press No to discard saving.

8. Close the tuning window.

Alternative steps

- From the **Operating mode** drop-down menu, set mode to **Local**.
- Choose **Tuning→WCDMA→Rx AGC Alignment.**
- Click **Start**.
- Check the **Tune Rx Band Response** check box and click **Tune**.



Settings

Duration: 8

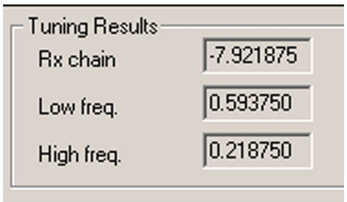
AFC: 1024

☑ Tune Rx Band Response

- Setup the signal generator according to the values in the pop-up window:

Frequency list:	2113.4 MHz, 2141 MHz and 2166.6 MHz
Dwell time:	2 ms
Sweep control:	Automatic continuous sweep
Level:	–48 dBm + cable and adapter attenuations
Modulation:	FM
Deviation:	500 kHz
Modulation frequency:	50 kHz

- Click **OK**.
- Check that the **Rx chain** , **Low freq.** and **High freq.** values in the *Tuning Results* window are within the limits presented in the following table.



Rx chain -7.921875

Low freq. 0.593750

High freq. 0.218750

	Min	Typ	Max	Unit
Rx chain	-6	1.5... 3.5	6	dB
Low freq	-5	-0.7...4.0	5	
High freq	-5	-0.7...4.0	5	

- If the Rx gain is acceptable, click **Yes** to save the results to the phone.
- To end the calibration, click **Close**.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

Tx AGC & power detector tuning has two purposes:

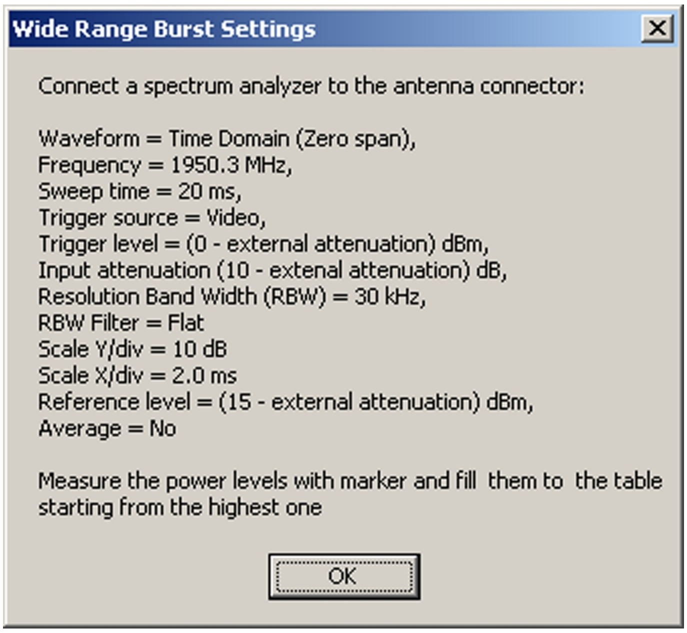
- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

There are two ways to perform the tuning. For an alternative method, see Alternative steps (page 7–46).

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→Tx AGC & Power Detector.**
3. Click **Start**.
4. In the *Wide Range* pane, click **Tune** (the leftmost **Tune** button).

5. Set up the spectrum analyzer in the following way:



Connect a spectrum analyzer to the antenna connector:

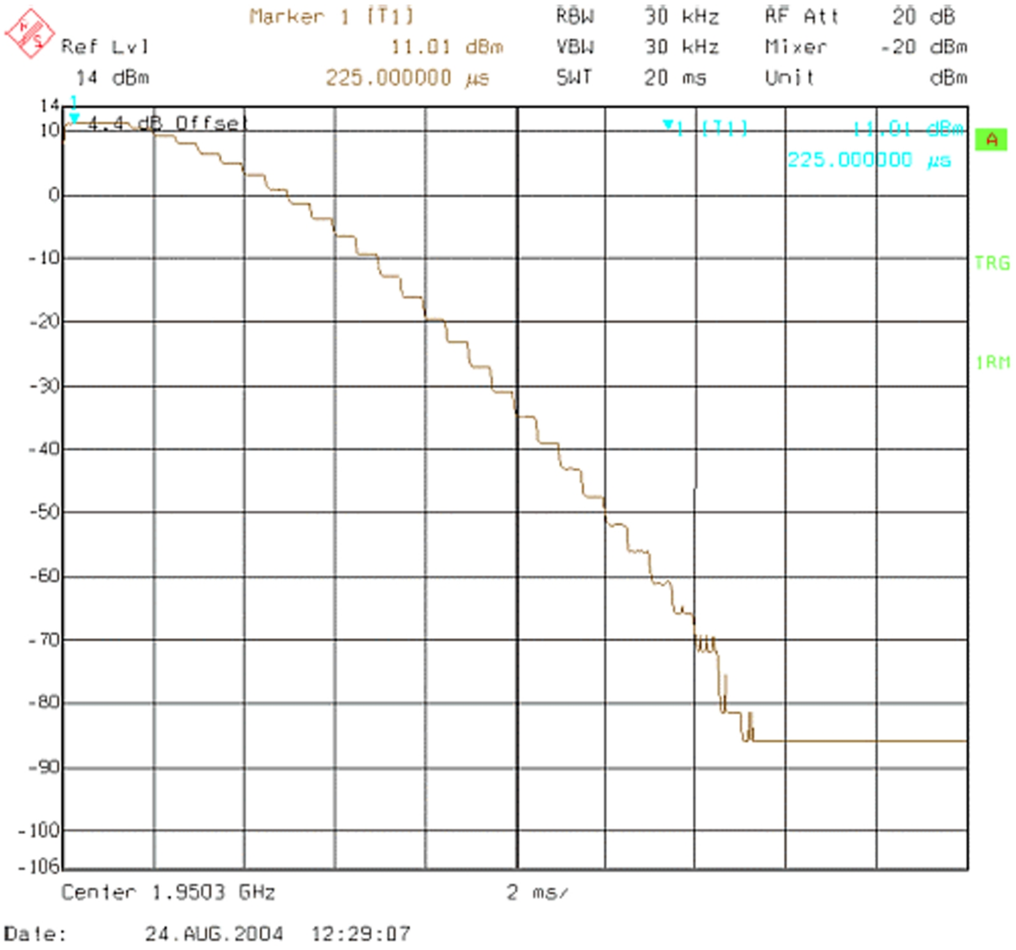
Waveform = Time Domain (Zero span),
Frequency = 1950.3 MHz,
Sweep time = 20 ms,
Trigger source = Video,
Trigger level = (0 - external attenuation) dBm,
Input attenuation (10 - extenal attenuation) dB,
Resolution Band Width (RBW) = 30 kHz,
RBW Filter = Flat
Scale Y/div = 10 dB
Scale X/div = 2.0 ms
Reference level = (15 - external attenuation) dBm,
Average = No

Measure the power levels with marker and fill them to the table starting from the highest one

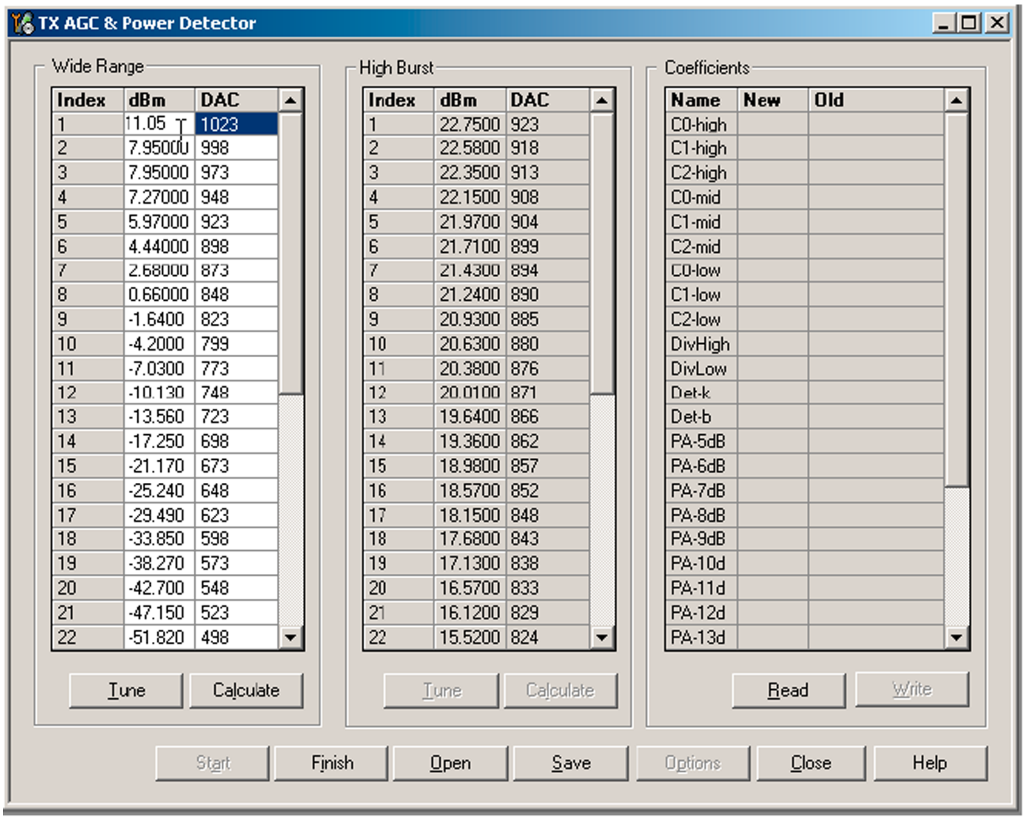
6. After setting the spectrum analyzer, click **OK**.
7. Measure the power levels with a marker.

   Take the first measurement from 250 us after the trigger, the second from 750 us, the third on 1220 us and so on in every 500 us until the table is filled.

   > **Note:** It must be possible to measure power levels down to –68 dBm. The measured power levels must be monotonously decreasing.
   >
   > Make sure that the marker is not measuring the level of noise spike on lower levels.


Marker 1 [T1]
11.01 dBm
225.000000 µs
RBW 30 kHz
RF Att 20 dB
Ref Lvl
14 dBm
VBW 30 kHz
Mixer -20 dBm
SWT 20 ms
Unit dBm
14
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-106
1
4.4 dB Offset
▼1 [T1]
11.01 dBm
225.000000 µs
A
TRG
1RM
Center 1.9503 GHz
2 ms/
Date: 24.AUG.2004 12:29:07

8. Fill in the power level values (in dBm) to the *Wide Range* table.



Wide Range

Index	dBm	DAC
1	11.05	1023
2	7.95000	998
3	7.95000	973
4	7.27000	948
5	5.97000	923
6	4.44000	898
7	2.68000	873
8	0.66000	848
9	-1.6400	823
10	-4.2000	799
11	-7.0300	773
12	-10.130	748
13	-13.560	723
14	-17.250	698
15	-21.170	673
16	-25.240	648
17	-29.490	623
18	-33.850	598
19	-38.270	573
20	-42.700	548
21	-47.150	523
22	-51.820	498

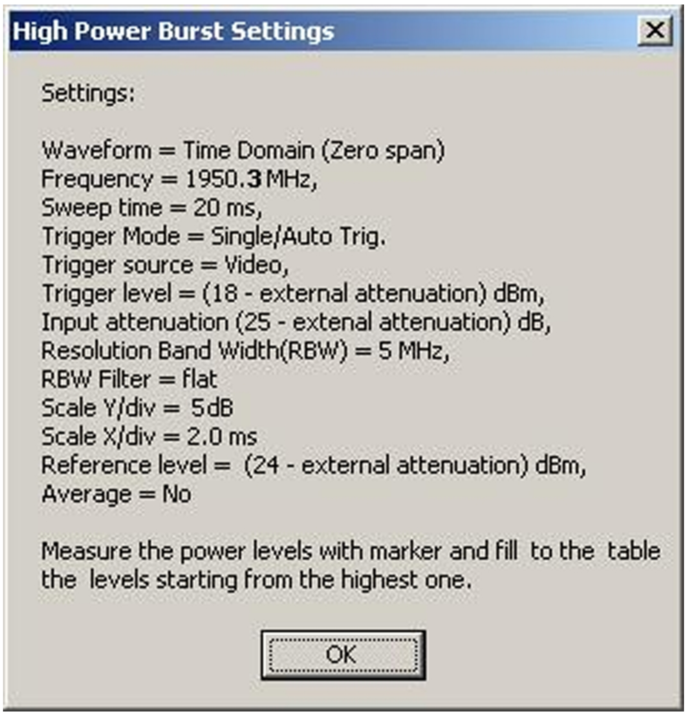
High Burst

Index	dBm	DAC
1	22.7500	923
2	22.5800	918
3	22.3500	913
4	22.1500	908
5	21.9700	904
6	21.7100	899
7	21.4300	894
8	21.2400	890
9	20.9300	885
10	20.6300	880
11	20.3800	876
12	20.0100	871
13	19.6400	866
14	19.3600	862
15	18.9800	857
16	18.5700	852
17	18.1500	848
18	17.6800	843
19	17.1300	838
20	16.5700	833
21	16.1200	829
22	15.5200	824

Coefficients

Name	New	Old
C0-high		
C1-high		
C2-high		
C0-mid		
C1-mid		
C2-mid		
C0-low		
C1-low		
C2-low		
DivHigh		
DivLow		
Det-k		
Det-b		
PA-5dB		
PA-6dB		
PA-7dB		
PA-8dB		
PA-9dB		
PA-10d		
PA-11d		
PA-12d		
PA-13d		

9. In the *Wide Range* pane, click **Calculate**.
10. In the *High Burst* pane, click **Tune**.
11. Adjust the spectrum analyzer according to the following settings:



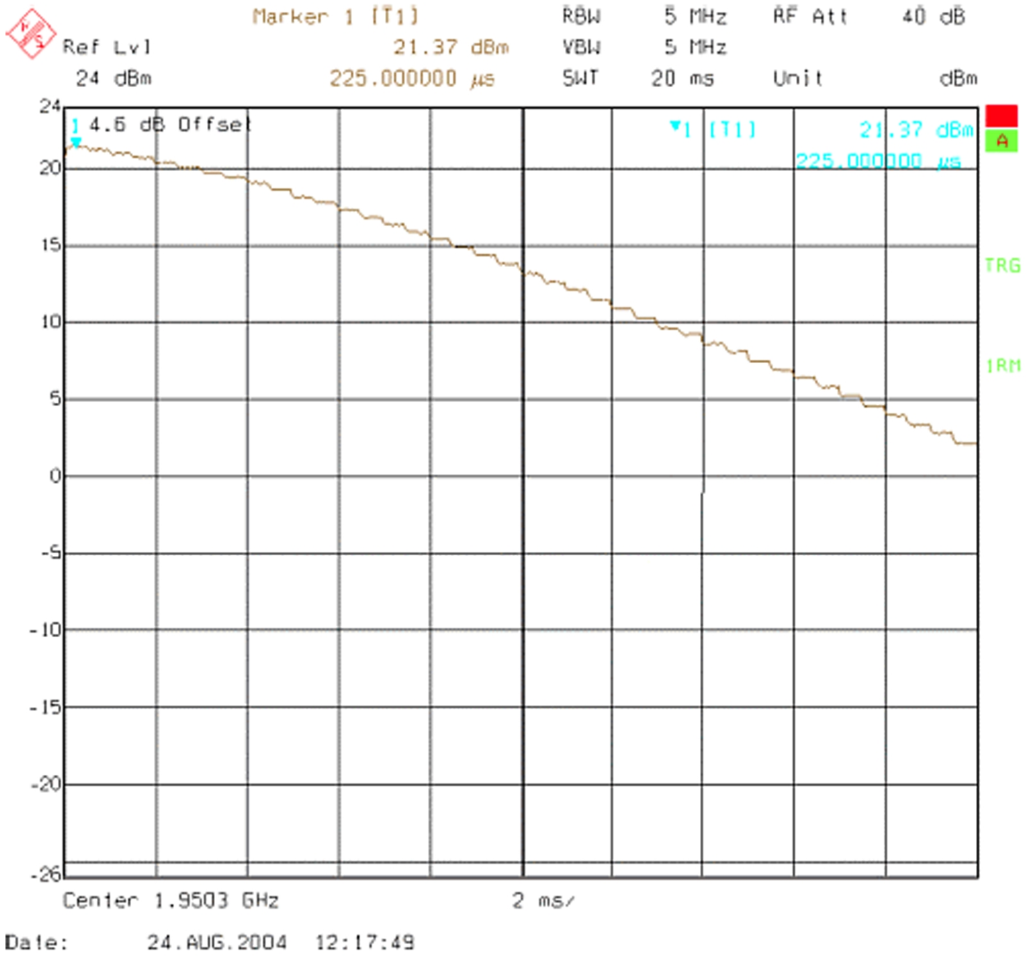
Settings:

Waveform = Time Domain (Zero span)
Frequency = 1950.3 MHz,
Sweep time = 20 ms,
Trigger Mode = Single/Auto Trig.
Trigger source = Video,
Trigger level = (18 - external attenuation) dBm,
Input attenuation (25 - extenal attenuation) dB,
Resolution Band Width(RBW) = 5 MHz,
RBW Filter = flat
Scale Y/div = 5dB
Scale X/div = 2.0 ms
Reference level = (24 - external attenuation) dBm,
Average = No

Measure the power levels with marker and fill to the table the levels starting from the highest one.

12. Measure the power levels with a marker.

    Take the first measurement from 250 us after the trigger, the second from 750 us, third on 1220 us and so on in every 500 us until the table is filled.



Marker 1 [T1]
21.37 dBm
225.000000 µs
Ref Lvl
24 dBm
RBW 5 MHz
VBW 5 MHz
SWT 20 ms
RF Att 40 dB
Unit dBm
1 4.6 dB Offset
Center 1.9503 GHz
2 ms/
Date: 24.AUG.2004 12:17:49

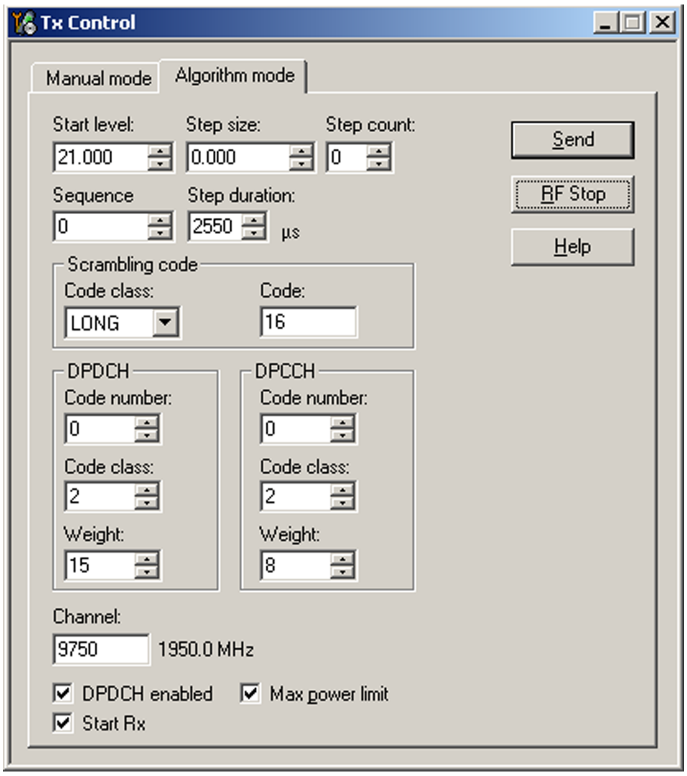
Figure 61 High burst measurement

13. In the *High Burst* pane, click **Calculate**.
14. Check that the calculated values are within the limits specified in the following table:

	Min	Max
C0-high	-0.5	5
C1-high	-50	50
C2-high	400	900
C0-mid	-0.7	0.7
C1-mid	0	50
C2-mid	400	900
C0-low	-4	4
C1-low	-400	440
C2-low	-10000	15000

	Min	Max
Det-k	100	220
Det-b	0	150

15. To save the coefficients to the phone, click **Write**.
16. To close the *Tx AGC & Power Detector* window, click **Close**.
17. Choose **Testing→WCDMA→ Tx Control.**
18. Select the *Algorithm* mode tab.



Start level: 21.000
Step size: 0.000
Step count: 0
Sequence 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code number: 0
Code class: 2
Weight: 15

DPCCH
Code number: 0
Code class: 2
Weight: 8

Channel: 9750 1950.0 MHz

☑ DPDCH enabled ☑ Max power limit
☑ Start Rx

19. Write the target power level 25 dBm to the *Start level* line and check the **Max power limit** check box (detector calibration check).
20. Setup the spectrum analyzer with the following settings:

Center frequency:	**1950.3 MHz**
Span:	0 Hz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	**24 dBm or -20 dBm depending on the level measured**
Input attenuation:	Automatic
Resolution bandwidth:	5 MHz
Video bandwidth:	5 MHz
Sweep time:	20 ms
Detector:	**RMS detector**

Average:	No
Trigger:	Free run

21. Click **Send**.
22. Measure the WCDMA output power.

    It should be around 21 dBm.
23. Click **RF Stop** and uncheck the **Max power limit** check box.
24. Repeat steps **19** to **23** for levels +19, +7, 0, -20 and –40 dBm.

    The measured output power may not differ more than +-2 dB from the requested value at level +19 dBm and no more than +-4 dB on lower levels.

    Remember to stop the RF before sending new data.

Alternative steps

- Measure the wide range levels normally and write down the levels that are possible to measure.
- Click **Finish**.
- Click **Options**.
- Change the first wide range DAC value to *573* and change the number of tuning steps to *21*.
- Change the spectrum analyzer reference level to *–20* dBm and adjust the input attenuator to the lowest value possible.
- In the *Wide Range* pane, click **Tune** and fill in the rest of values starting from the 19th level.

Tx band response calibration (WCDMA)

Context

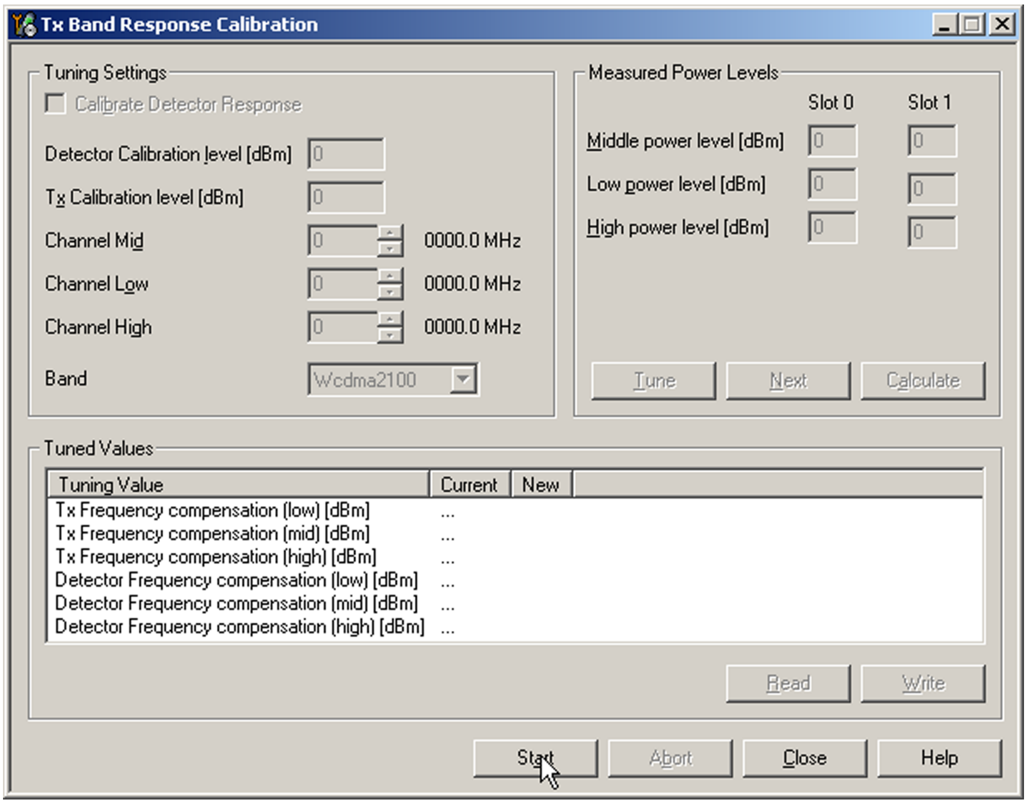
The purpose of this tuning operation is to calibrate the WCDMA Tx performance. It defines the power detector and Tx frequency compensation values. However, before starting this tuning procedure, it is necessary to carry out Tx AGC & Power Detector Calibration tuning. This is because its results will be needed for this tuning operation.

- In the *Tuning Settings* pane, it is possible to edit the numbers of channels used in this tuning operation.
- If the **Calibrate Detector Response** check box is checked, only Tx response is calibrated. Zero is written to the power detector compensation values block in the permanent memory (PM) of the terminal.
- **Detector Calibration level** shows the power level used for calibrating the power detector in this tuning procedure.
- **Tx Calibration level** shows the power level used for calibrating tx frequency in this tuning procedure.
- In *Measured Power Levels* pane, you can insert the dBm values read from the power meter.
- In *Tuned Values* pane, the values that are stored in the permanent memory (PM) of the terminal in Current columns are shown.
- New values are added to *New* column when the **Calculate** button is clicked.
- **Abort** button aborts the tuning operation without saving the tuned values.
- **Read** button reads the tuned values in the PM of the terminal, and displays them in the *Tuned Values* pane in in the *Current* column.

Steps

1. Start *Phoenix* service software.
2. Choose **File→Scan Product** .

3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→WCDMA→Tx Band Response Calibration** .
5. Click **Start**.



☐ Calibrate Detector Response

Detector Calibration level [dBm] 0

Tx Calibration level [dBm] 0

Channel Mid 0 0000.0 MHz

Channel Low 0 0000.0 MHz

Channel High 0 0000.0 MHz

Band Wcdma2100

	Slot 0	Slot 1
Middle power level [dBm]	0	0
Low power level [dBm]	0	0
High power level [dBm]	0	0

Tuning Value	Current	New
Tx Frequency compensation (low) [dBm]	...	
Tx Frequency compensation (mid) [dBm]	...	
Tx Frequency compensation (high) [dBm]	...	
Detector Frequency compensation (low) [dBm]	...	
Detector Frequency compensation (mid) [dBm]	...	
Detector Frequency compensation (high) [dBm]	...	

The current values are shown in the *Tuned Values* pane.

6. Click **Tune**.
7. Connect the power meter to the terminal, and set it to **Channel Mid** frequency.
8. Read the values of slot 0 and slot 1 from the power meter and enter them to **Middle power level** fields in the **Measured Power Levels** pane.

   Slot 0 is used for detector calibration and slot 1 for Tx calibration.
9. Click **Next**.
10. Switch the power meter to **Channel Low** frequency.
11. Read the values from the power meter, and enter them to **Low power level** fields.
12. Switch the power meter to **Channel High** frequency.
13. Read the values from the power meter, and enter them to **High power level** fields.
14. Click **Next**.
15. Click **Calculate**.

    The tuned values are shown in the *Tuned Values* pane in the *New* column.
16. Check that the tuned values are within the limits presented in the following table. If they are OK, click **Yes**.

	Min	Max
Tx Freq Comp (the first and last value)	-4	+4

17. To save the tuned values to the terminal, click **Write**.
18. Close the *Tx Band Response Calibration* window.

Tx LO leakage (WCDMA)

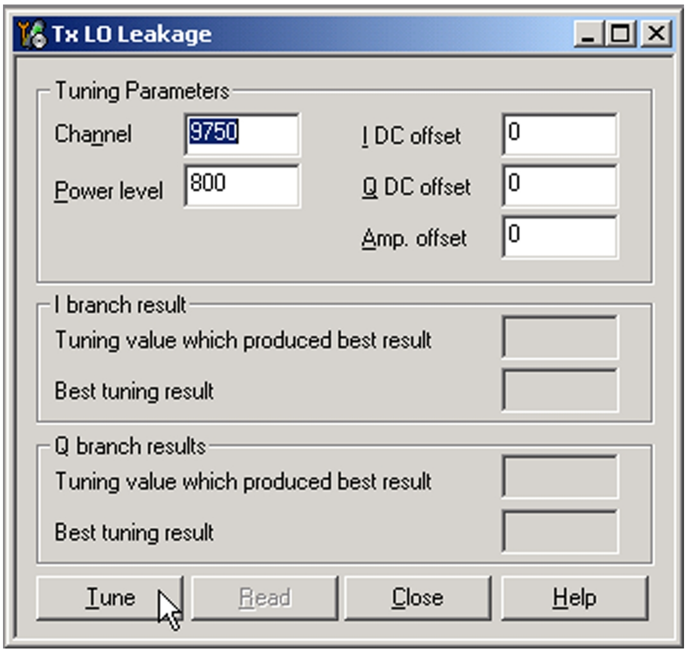
Context

The purpose of Tx LO leakage tuning is to minimize the carrier leakage of the IQ-modulator which is caused by the DC offset voltages in the Tx IQ-signal lines and in the actual IQ modulator.

The tuning improves WCDMA Tx AGC dynamics at low power levels. A self-calibration routine selects the best combination for internal control words in order to produce minimum LO leakage.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→ Tx LO Leakage** .
3. Click **Tune**.



Channel: 9750
Power level: 800
I DC offset: 0
Q DC offset: 0
Amp. offset: 0

Tx LO Leakage
Tuning Parameters
I branch result
Tuning value which produced best result
Best tuning result
Q branch results
Tuning value which produced best result
Best tuning result
Tune
Read
Close
Help

4. To end the tuning, click **Close**.

WLAN RF troubleshooting

Introduction to WLAN RF troubleshooting

All measurements should be done using a spectrum analyzer with a high-frequency high impedance passive probe (LO-/reference frequencies and RF power levels) and an oscilloscope with a 10:1 probe (DC-voltages and low frequency signals). Reference values are measured by using a 3 MHz RBW. If smaller RBW is used, power value will be smaller.

The WLAN RF section is built around one RF ASIC (STLC4370) and the front end module (FEM) (N6301).

Before changing the WLAN RF ASIC, please check that supply voltage ~VBAT and serial communication coming from baseband to STLC4370 are normal. Communication from baseband to STLC4370 can be checked using Phoenix. Perform both WLAN Tx and Rx Tests, and if the tests can be started without error messages, communication is working.

Note: Most RF semiconductors are static discharge sensitive. ESD protection must be taken care of during repair (ground straps and ESD soldering irons).

STLC4370 and N6302 are moisture sensitive so parts must be pre-baked prior to soldering.

In addition to key components described in this section, there are a lot of discrete components (resistors, inductors and capacitors) which troubleshooting is done by checking if soldering of the component is done properly (for factory repairs checking if it is missing from PWB).

Short circuits on capacitors and resistor values can be verified with an ohmmeter. Remember that in-circuit measurements should be evaluated carefully.

Note: Remember that all measured voltages or RF levels in this document are rough figures. Especially RF levels varies due to different measuring equipment or different grounding of the probe used . When using an RF probe it is recommended to use metallic tweezers to connect the probe ground to the PWB ground as close to the measurement point as possible.

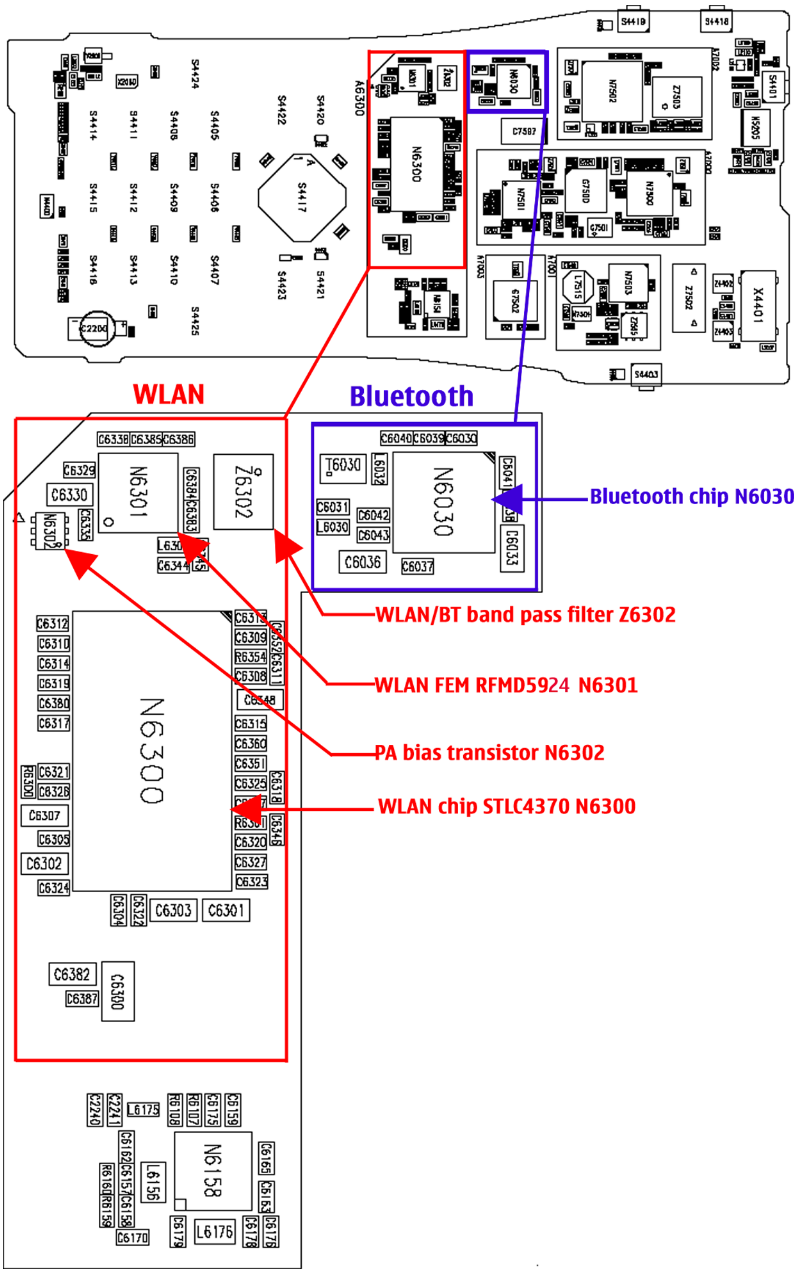

WLAN
Bluetooth
Bluetooth chip N6030
WLAN/BT band pass filter Z6302
WLAN FEM RFMD5924 N6301
PA bias transistor N6302
WLAN chip STLC4370 N6300
N6300
N6301
Z6302
N6302
N6030
N6158
A6300
X4401

Figure 62 WLAN and Bluetooth key component placement

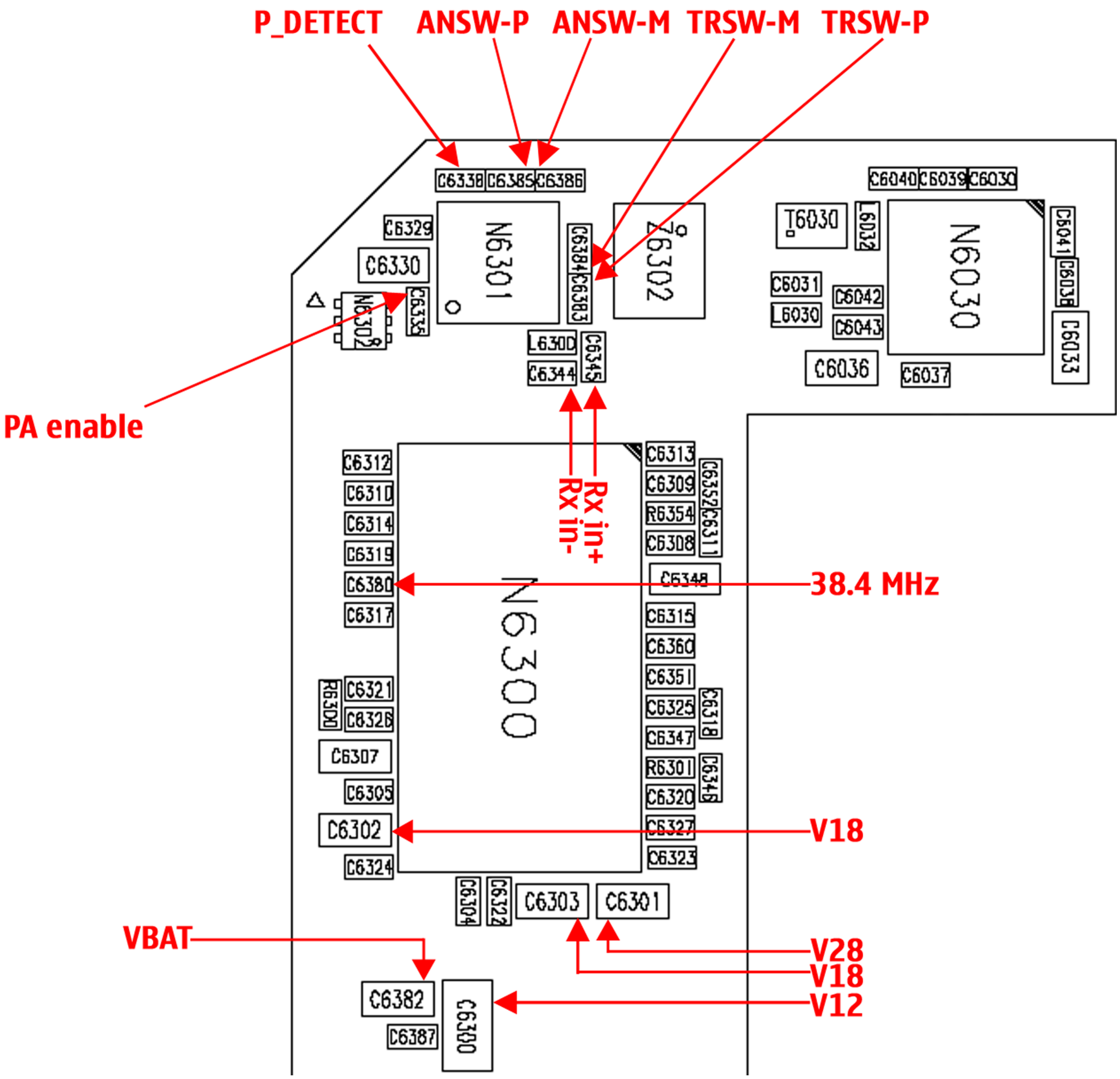

P_DETECT
ANSW-P
ANSW-M
TRSW-M
TRSW-P
C6338
C6385
C6386
C6040
C6039
C6030
C6329
C6330
N6301
Z6302
C6384
C6383
T6030
L6032
N6030
C6041
C6038
C6031
L6030
C6042
C6043
C6033
N6302
C6334
L6300
C6345
C6344
C6036
C6037
PA enable
C6312
C6310
C6314
C6319
C6380
C6317
C6313
C6309
R6354
C6308
C6352
C6311
C6348
Rx in+
Rx in-
N6300
38.4 MHz
C6315
C6360
C6351
C6325
C6318
C6347
R6301
C6346
C6320
C6327
C6323
R6300
C6321
C6326
C6307
C6305
C6302
C6324
V18
C6304
C6322
C6303
C6301
VBAT
V28
V18
V12
C6382
C6387
C6300

Figure 63 WLAN RF measurement points

General instructions for WLAN Tx troubleshooting

Steps

1. Connect MJ-78 with a control unit to a computer with a DAU-9S cable.

   Alternatively, if you are using FPS-8, use an XCS-4 modular cable and a USB cable.

   Note: Make sure you have a PKD-1 dongle connected to the computer parallel port.

2. Connect a DC power supply to the module test jig with a power cable.

   Note: Turn off the DC power supply at this stage.

   When repairing or tuning the transmitter, use external DC supply with at least 3 A current capability. Set the DC supply voltage to 12 V, and set the jumper connector on test jig to the **bypass** position.

3. Connect an RF cable between the RF connector of the module test jig and measurement equipment.

   Use a spectrum analyzer as measurement equipment.

   > **Note:** The maximum input power of a spectrum analyzer is +30 dBm. It is recommended to use 10 dB attenuator on the spectrum analyzer input to prevent any damage to the measurement equipment. Use at least 10 dB attenuator, otherwise the PA may be damaged.

4. Place the phone module to the test jig.
5. Turn on the DC power supply, and wait for the LED on jig turns on.
6. Start *Phoenix* service software.

   > **Note:** Make sure *Phoenix* software version is not older than v2005_44_0_116.

7. Initialize connection to the phone.

   Use FBUS driver when using DAU-9S.

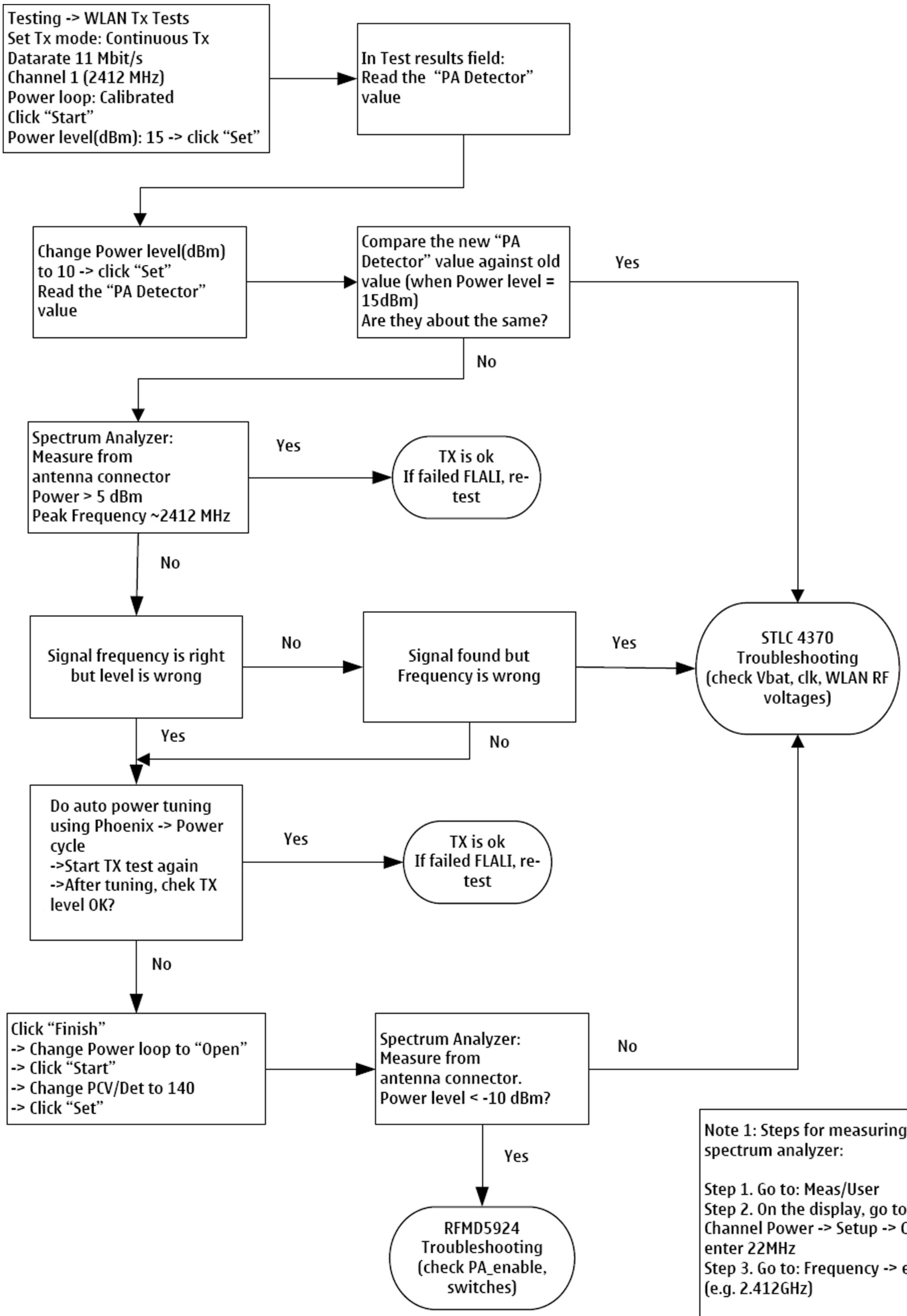
8. Choose **File→Scan Product** .
9. From the toolbar, set operating mode to **Local**.
10. Choose **Testing→WLAN Tx Tests.**
11. In the *WLAN Tx Tests* window, use the following settings:
    - Test mode: **Continuous**
    - Data rate: **11 MBit/s (Clk)**
    - Channel: **1 (2.412 GHz)**)
    - Power loop: **Calibrated**
    - All other items use defaults
12. Click **Start**.

    > **Note:** If you get a warning message *"Power Control" value got from the product out of range. Only values -20-30 (dBm) are allowed*, please ignore it, and click **OK** to continue.

13. In the **Power level (dBm)** field, set value to **15 dBm**
14. Click **Set**.

WLAN Tx troubleshooting

Troubleshooting flow


Testing -> WLAN Tx Tests
Set Tx mode: Continuous Tx
Datarate 11 Mbit/s
Channel 1 (2412 MHz)
Power loop: Calibrated
Click "Start"
Power level(dBm): 15 -> click "Set"
In Test results field: Read the "PA Detector" value
Change Power level(dBm) to 10 -> click "Set" Read the "PA Detector" value
Compare the new "PA Detector" value against old value (when Power level = 15dBm) Are they about the same?
Yes
No
Spectrum Analyzer: Measure from antenna connector Power > 5 dBm Peak Frequency ~2412 MHz
Yes
TX is ok If failed FLALI, re-test
No
Signal frequency is right but level is wrong
No
Signal found but Frequency is wrong
Yes
STLC 4370 Troubleshooting (check Vbat, clk, WLAN RF voltages)
Yes
No
Do auto power tuning using Phoenix -> Power cycle ->Start TX test again ->After tuning, chek TX level OK?
Yes
TX is ok If failed FLALI, re-test
No
Click "Finish" -> Change Power loop to "Open" -> Click "Start" -> Change PCV/Det to 140 -> Click "Set"
Spectrum Analyzer: Measure from antenna connector. Power level < -10 dBm?
No
Yes
RFMD5924 Troubleshooting (check PA_enable, switches)

Note 1: Steps for measuring WLAN power level on spectrum analyzer:

Step 1. Go to: Meas/User
Step 2. On the display, go to: Power Menu -> Channel Power -> Setup -> Channel Bandwidth -> enter 22MHz
Step 3. Go to: Frequency -> enter channel frequency (e.g. 2.412GHz)

Note 2: Reference values are measured by using RBW 3 MHz. If smaller RBW is used then power value will be smaller.

Note 3: Signal levels here do not accurately reflect loss from test probes, so the tolerance can be quite large, for example, even +/- 5dB is acceptable.

General instructions for WLAN Rx troubleshooting

Steps

1. Connect MJ-78 with a control unit to a computer with a DAU-9S cable.

   Alternatively, if you are using FPS-8, use an XCS-4 modular cable and a USB cable.

   Note: Make sure that you have a PKD-1 dongle connected to the computer parallel port.
2. Connect a DC power supply to the module test jig with a power cable.

   Note: Turn off the DC power supply at this stage.

   When repairing or tuning the receiver, use an external DC supply with at least 3 A current capability. Set the DC supply voltage to 12 V, and set the jumper connector on the test jig to the **bypass** position.
3. Connect an RF cable between the RF connector of the module test jig and RF signal generator.
4. Place the phone module to the test jig.
5. Turn on the DC power supply, and wait for the LED on jig turns on.
6. Start *Phoenix* service software.

   Make sure the *Phoenix* service software version on your computer is not older than v2005_44_0_116.
7. Initialize connection to the phone.

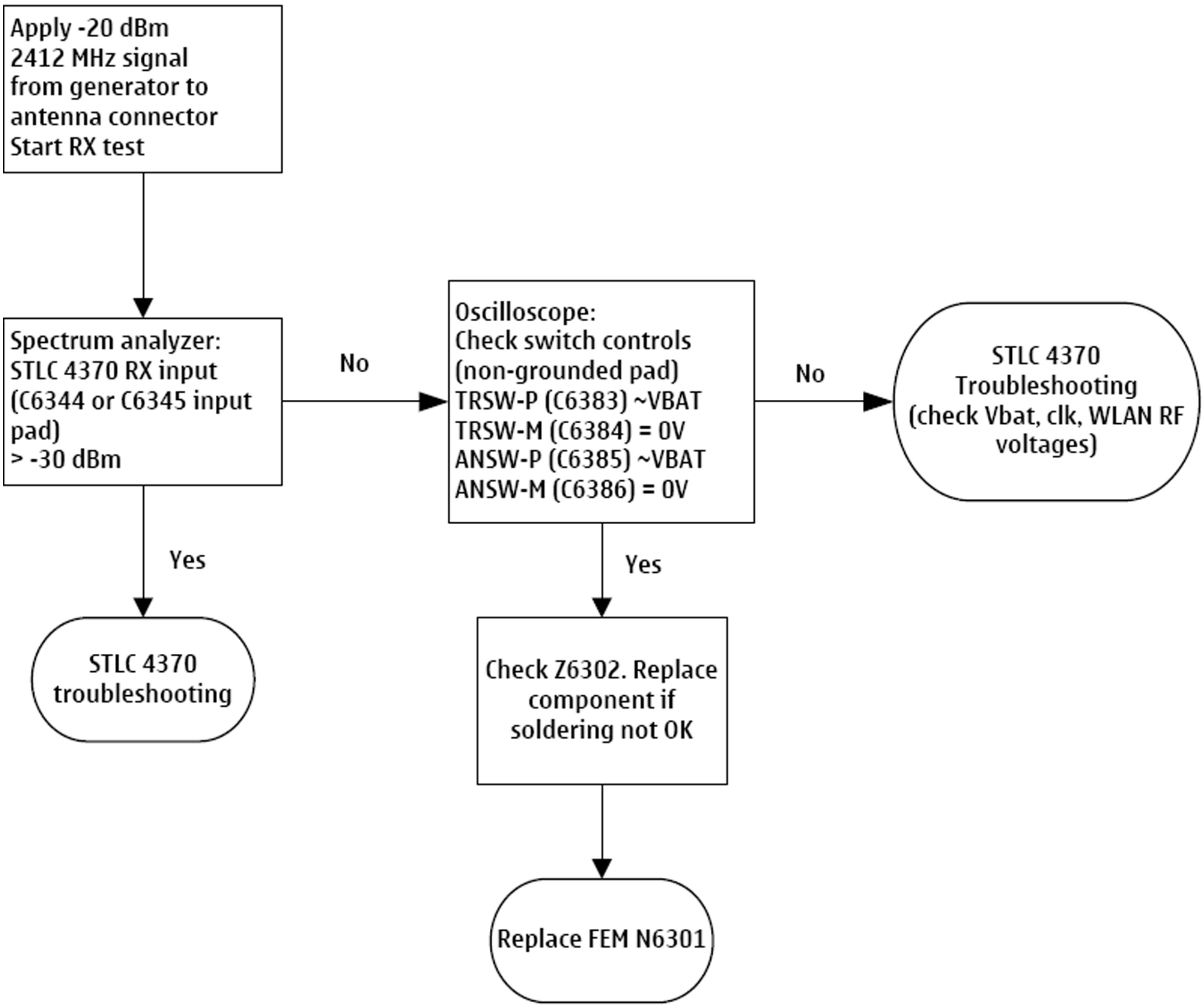
   Use FBUS driver when using DAU-9S.
8. Choose **File→Scan Product.**
9. From the toolbar, set operating mode to **Local**.
10. Choose **Testing→WLAN Rx Tests.**
11. In the *WLAN Rx Tests* window, use the following settings:
    - Test mode: **Generator mode**
    - Channel: **1 (2.412 GHz)**
12. Click **Start**.

WLAN Rx troubleshooting

Troubleshooting flow

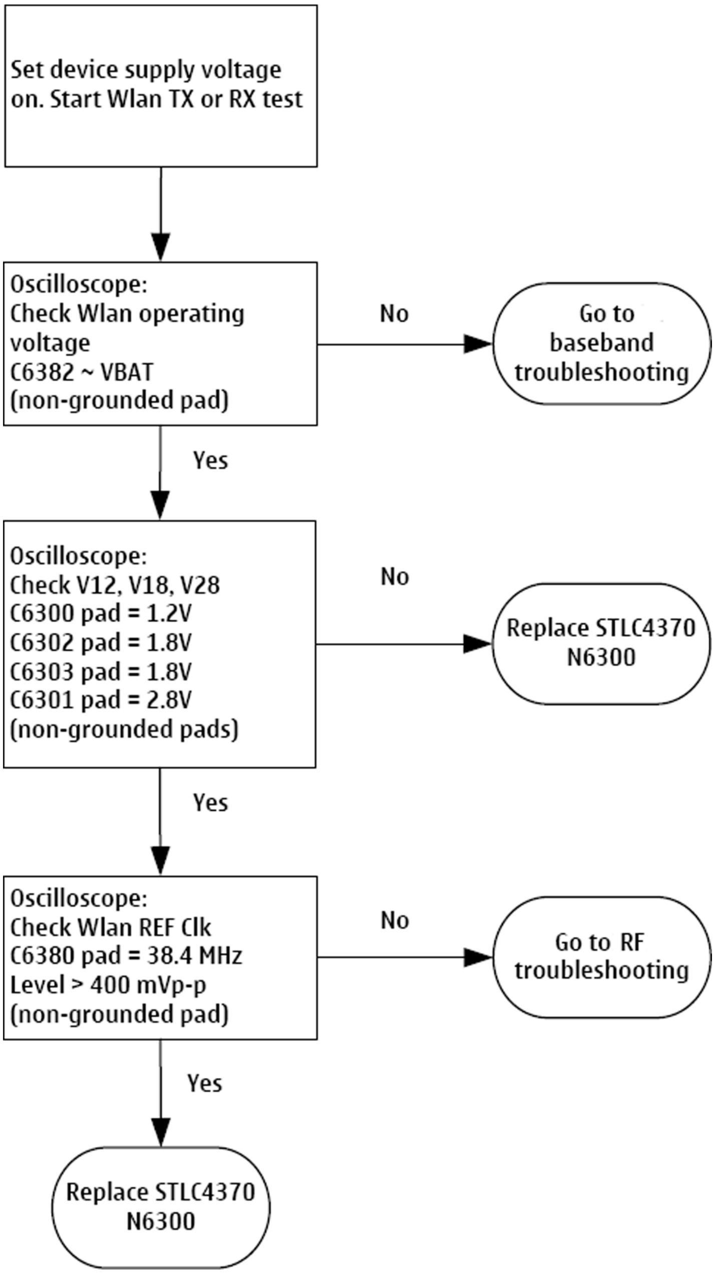
Note1: Power levels here are just rough figures. The purpose is to make sure there is signal present instead of just measuring noise floor. And the signals here might not accurately reflect the loss from test probes used. So the tolerance can be quite large, for example, even +/- 5dB is acceptable.

Note2: Generator level can be set higher if needed. Just keep in mind that levels will be different in whole chain respectively.


Apply -20 dBm
2412 MHz signal
from generator to
antenna connector
Start RX test
Spectrum analyzer:
STLC 4370 RX input
(C6344 or C6345 input
pad)
> -30 dBm
No
Oscilloscope:
Check switch controls
(non-grounded pad)
TRSW-P (C6383) ~VBAT
TRSW-M (C6384) = 0V
ANSW-P (C6385) ~VBAT
ANSW-M (C6386) = 0V
No
STLC 4370
Troubleshooting
(check Vbat, clk, WLAN RF
voltages)
Yes
STLC 4370
troubleshooting
Yes
Check Z6302. Replace
component if
soldering not OK
Replace FEM N6301

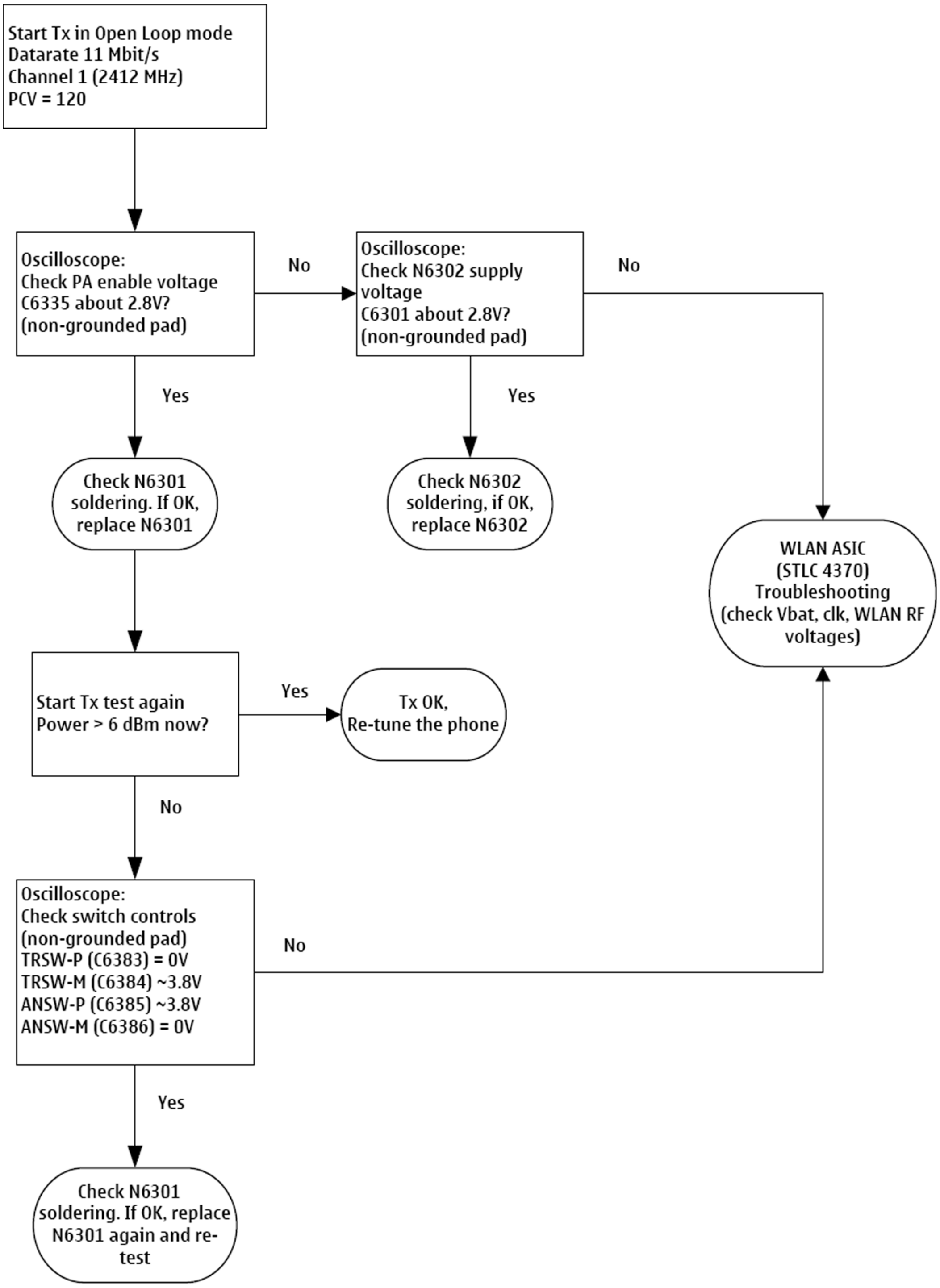
STLC4370 troubleshooting

Troubleshooting flow


Set device supply voltage on. Start Wlan TX or RX test
Oscilloscope:
Check Wlan operating voltage
C6382 ~ VBAT
(non-grounded pad)
No
Go to baseband troubleshooting
Yes
Oscilloscope:
Check V12, V18, V28
C6300 pad = 1.2V
C6302 pad = 1.8V
C6303 pad = 1.8V
C6301 pad = 2.8V
(non-grounded pads)
No
Replace STLC4370 N6300
Yes
Oscilloscope:
Check Wlan REF Clk
C6380 pad = 38.4 MHz
Level > 400 mVp-p
(non-grounded pad)
No
Go to RF troubleshooting
Yes
Replace STLC4370 N6300

RFMD 5924 troubleshooting

Troubleshooting flow


Start Tx in Open Loop mode
Datarate 11 Mbit/s
Channel 1 (2412 MHz)
PCV = 120
Oscilloscope:
Check PA enable voltage
C6335 about 2.8V?
(non-grounded pad)
No
Oscilloscope:
Check N6302 supply voltage
C6301 about 2.8V?
(non-grounded pad)
No
Yes
Yes
Check N6301 soldering. If OK, replace N6301
Check N6302 soldering, if OK, replace N6302
WLAN ASIC (STLC 4370) Troubleshooting (check Vbat, clk, WLAN RF voltages)
Start Tx test again
Power > 6 dBm now?
Yes
Tx OK, Re-tune the phone
No
Oscilloscope:
Check switch controls
(non-grounded pad)
TRSW-P (C6383) = 0V
TRSW-M (C6384) ~3.8V
ANSW-P (C6385) ~3.8V
ANSW-M (C6386) = 0V
No
Yes
Check N6301 soldering. If OK, replace N6301 again and re-test

Appendix A: Additional RF Troubleshooting Instructions

Table of Contents

1. Using these instructions 4
2. RF Self tests 5
  2.1 RF-BB interface (ST_CDSP_RF_BB_IF_TEST) 7
  2.2 Supply test for Hinku and Vinku (ST_CDSP_RF_SUPPLY_TEST) 9
  2.3 TX IQ self test (ST_CDSP_TX_IQ_TEST) 13
  2.4 TXC Data test (ST_TXC_DATA_TEST) 14
  2.5 WCDMA power detector biasing self test (ST_CDSP_PWR_DETECTOR_BIAS_TEST) 15
    2.5.1 WCDMA power detector ok? 15
  2.6 RX PLL phase lock self test (ST_CDSP_RX_PLL_PHASE_LOCK_TEST) 17
  2.7 TX PLL phase lock self test (ST_CDSP_TX_PLL_PHASE_LOCK_TEST) 18
  2.8 WCDMA transmitter self test (ST_CDSP_WCDMA_TX_POWER_TEST) 19
  2.9 RX IQ loop back self test (ST_CDSP_RX_IQ_LOOP_BACK_TEST) 20
  2.10 GSM transmitter self test (ST_CDSP_GSM_TX_POWER_TEST) 21
  2.11 Error Code Interpretation Examples 22
    2.11.1 Example 1 22
    2.11.2 Example 2 22
    2.11.3 Example 3 22
3. Does the phone register to the network and make a call (GSM)? 24
  3.1 GSM transmitter power levels and transmit frequency ok? 24
    3.1.1 Does GSM TX transmit RF-power at all? 25
    3.1.2 Does GSM TX transmit enough RF-power and power levels otherwise ok? 32
    3.1.2 33
    3.1.3 GSM transmitter frequency correct? 39
  3.2 Does the phone give realistic RSSI-values? 41
    3.2.1 Is Hinku (N7500) ASIC receiving RF-power correctly from the GSM-antenna connector? 42
  3.3 GSM Transmitter phase error ok? 44
    3.3.1 Are capacitors in Vinku REG1 and REG2 lines in place? 44
    3.3.2 Are capacitors in GSM PA power supply line in place? 45
    3.3.3 Are TX-IQ signals ok? 45
    3.3.4 Is TX VCO signal level in the T7503 output high enough? 45
    3.3.5 VCTCXO frequency and output level correct? 45
  3.4 GSM (GMSK) modulation spectrum ok? 46
    3.4.1 Are components in GSM power control loop in place and working ok? 47
    3.4.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok? 47
    3.4.3 Are TX-IQ signals ok? 48
    3.4.4 Is TX VCO signal level in the T7503 output high enough? 48
    3.4.5 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield. 49
  3.5 TX power vs. time ok? 49
    3.5.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield. 49
    3.5.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok? 49
    3.5.3 Does GSM PA (N7502) get correct DET_SW_G -voltage from Vinku ASIC (N7501)? 50
    3.5.4 Are components in GSM power control loop in place and working ok? 50
4. Does the phone register to the callbox and make a call (WCDMA)? 52
  4.1 WCDMA TX power and transmit frequency ok? 52
    4.1.1 Does the WCDMA TX transmit RF-power at all? 52

    - 4.1.2 Does WCDMA TX transmit enough RF-power and power levels otherwise ok? 59
    - 4.1.3 WCDMA transmitter frequency correct? 64
  - 4.2 Does the phone give realistic RSSI-values? 67
    - 4.2.1 Does duplex-filter (Z7502) work properly? 67
    - 4.2.2 VREF-voltage ok? 67
    - 4.2.3 VXO-voltage ok? (=Vdig). 68
    - 4.2.4 VRCP1-voltage ok? 68
    - 4.2.5 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield. 70
  - 4.3 WCDMA modulation spectrum and ACLR ok? 70
    - 4.3.1 Does N7504 give correct voltage level (Vcc11) to the WCDMA PA (N7503)? 71
    - 4.3.2 Does WCDMA PA (N7503) get correct bias currents Icont11 and Icont12? 72
    - 4.3.3 Are TX-IQ signals ok? 73
    - 4.3.4 Is TX VCO signal level in the T7503 output high enough? 73
- 5. Does the phone have a reliable connection to the network (GSM)? 74
  - 5.1 GSM receiver Bit Error Rate (BER) ok? 74
    - 5.1.1 Does the phone give realistic RSSI-values? 74
    - 5.1.2 Hinku (N7500) or RAP3G (D2800) faulty? 74
  - 5.2 GSM transmitter power levels and transmit frequency ok? 74
  - 5.3 GSM Transmitter phase error ok? 74
  - 5.4 GSM (GMSK) modulation spectrum ok? 74
  - 5.5 TX power vs. time ok? 74
- 6. Does the phone have a reliable connection to the network (WCDMA)? 75
  - 6.1 WCDMA receiver Bit Error Rate (BER) ok? 75
    - 6.1.1 Does the phone give realistic RSSI-values? 75
    - 6.1.2 Hinku (N7500) or RAP3G (D2800) faulty? 75
  - 6.2 WCDMA TX power and transmit frequency ok? 75
  - 6.3 WCDMA Transmitter error vector magnitude ok? 75
    - 6.3.1 Is capacitor C7579 in WCDMA PA (N7503) bias line in place? 76
    - 6.3.2 Are capacitors in Vinku REG1 and REG2 lines in place? 76
    - 6.3.3 Are capacitors in WCDMA PA power supply lines in place? 76
    - 6.3.4 Are TX-IQ signals ok? 76
    - 6.3.5 Is TX VCO signal level in the T7503 output high enough? 76
    - 6.3.6 VCTCXO frequency and output level correct? 77
  - 6.4 WCDMA modulation spectrum and ACLR ok? 77
  - 6.5 Troubleshooting pictures 78
    - 6.5.1 VCTCXO Output (DC Offset 1.24 V) 78
    - 6.5.2 TXC in GSM mode (DC Offset 0 V) 78
    - 6.5.3 TX VC in GSM mode (DC Offset 1.8 V) 79
    - 6.5.4 Icont_21/Icont_22 (DC Offset 1.2 V) 79
    - 6.5.5 Icont_31/Icont_32 (DC Offset 1.2 V) 80
    - 6.5.6 GSM RX IQ (DC Offset 0.4 V) 81
    - 6.5.7 RX VC in GSM mode (DC Offset 1.5 V) 81
    - 6.5.8 TX Modulation spectrum (GSM) 83
    - 6.5.9 RFBUS 83

1. USING THESE INSTRUCTIONS

The following sections include lots of headings and subheadings that are asking simple positive style questions.

For example heading 4.2 asks if the phone does measure RSSI-values correctly in GSM-bands. If the answer is “Yes” then user should go to the next heading on the same level (heading number that has as many decimal numbers as the heading 4.2) In our example case moving to the section 4.3. If the answer is “No” then user should go to one heading level deeper in hierarchical system meaning the section 4.2.1 in our example case.

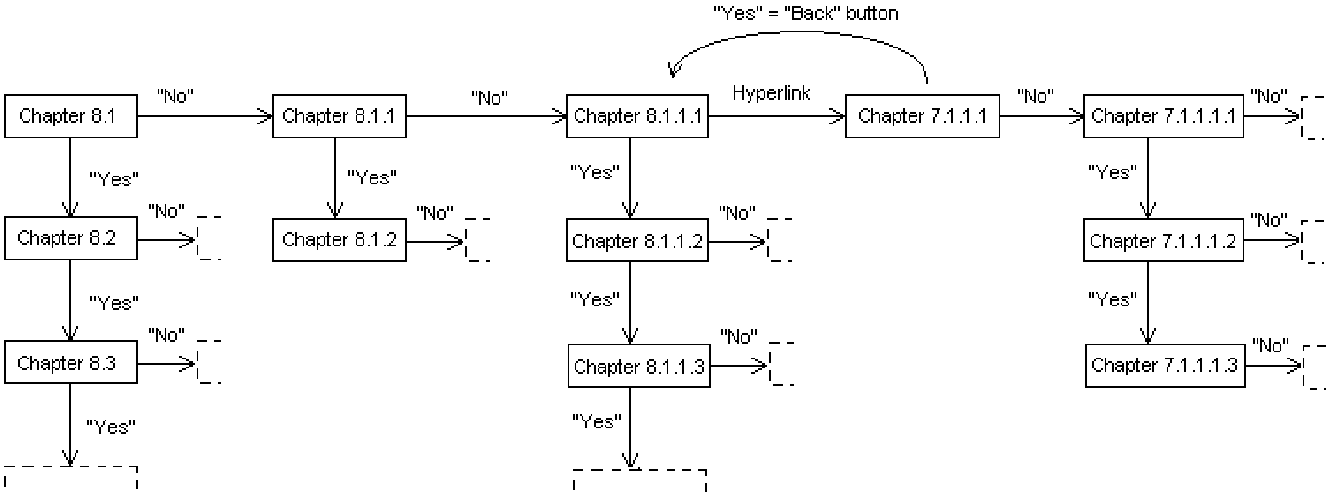

"Yes" = "Back" button
Chapter 8.1
"No"
Chapter 8.1.1
"No"
Chapter 8.1.1.1
Hyperlink
Chapter 7.1.1.1
"No"
Chapter 7.1.1.1.1
"No"
"Yes"
"Yes"
"Yes"
"Yes"
Chapter 8.2
"No"
Chapter 8.1.2
"No"
Chapter 8.1.1.2
"No"
Chapter 7.1.1.1.2
"No"
"Yes"
"Yes"
"Yes"
Chapter 8.3
"No"
Chapter 8.1.1.3
"No"
Chapter 7.1.1.1.3
"No"
"Yes"
"Yes"

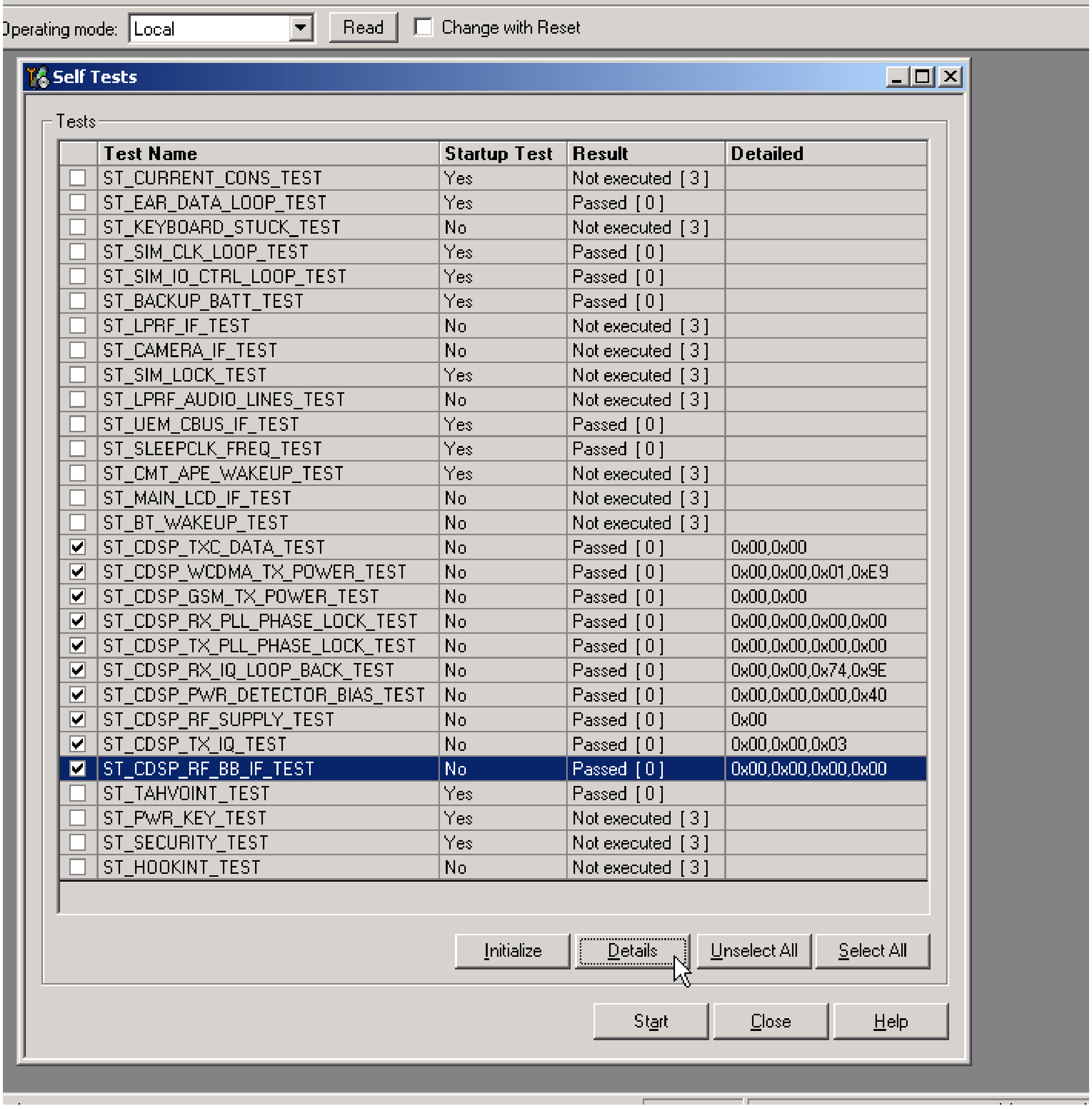
Figure 1 Use of this troubleshooting manual presented with an example. Notice that real section numbers are not used.

2. RF SELF TESTS

The RF part of the device is equipped with self test functionality which tests most of RF-BB interface signals and some parts of RF circuitry. Self tests are designed to detect faults on some critical parts, but they can not prove that everything is OK even if all the self tests are passed.

Self-tests can be run with Phoenix service software. Tests can return pass/fail result and detailed measurement data and error codes in fail case. Select “Testing” -> “Self Tests” from the Phoenix menu. Select appropriate RF self tests and run them with “Start”-button. Notice that self tests should be run in “Local”-mode (change “Operating Mode” to “Local” in Phoenix before running self tests). For service tool usage instructions refer to the “Service Software” and “Service Tools and Service Concepts” sections.

NOTICE! Perform WCDMA transmitter self test (ST_CDSP_WCDMA_TX_POWER_TEST) always in an RF shielded environment (for example in an RF-shield box).



Operating mode: Local

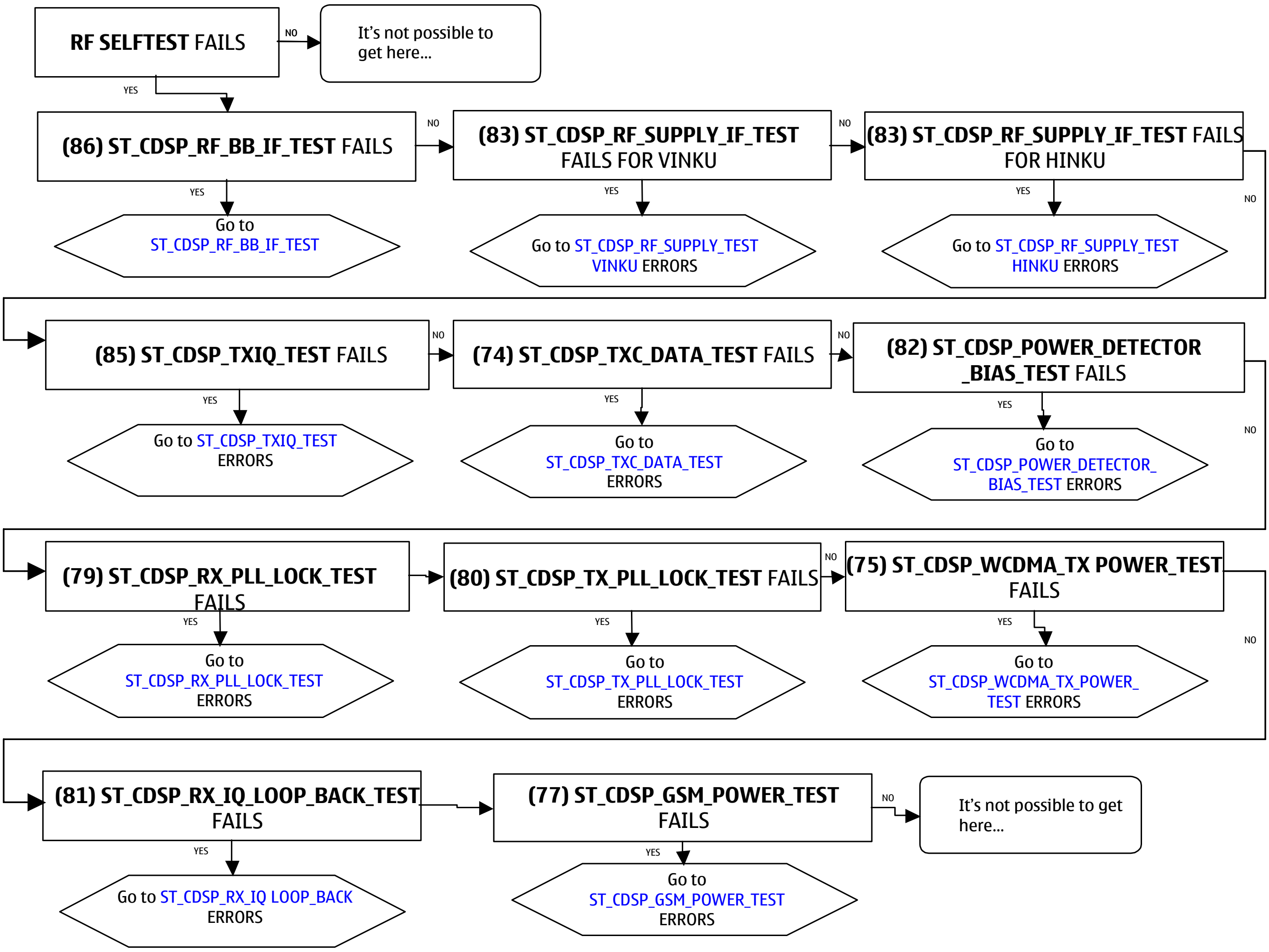
☐ Change with Reset

	Test Name	Startup Test	Result	Detailed
☐	ST_CURRENT_CONS_TEST	Yes	Not executed [3]	
☐	ST_EAR_DATA_LOOP_TEST	Yes	Passed [0]	
☐	ST_KEYBOARD_STUCK_TEST	No	Not executed [3]	
☐	ST_SIM_CLK_LOOP_TEST	Yes	Passed [0]	
☐	ST_SIM_IO_CTRL_LOOP_TEST	Yes	Passed [0]	
☐	ST_BACKUP_BATT_TEST	Yes	Passed [0]	
☐	ST_LPRF_IF_TEST	No	Not executed [3]	
☐	ST_CAMERA_IF_TEST	No	Not executed [3]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☐	ST_LPRF_AUDIO_LINES_TEST	No	Not executed [3]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	Yes	Passed [0]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☐	ST_BT_WAKEUP_TEST	No	Not executed [3]	
☑	ST_CDSP_TXC_DATA_TEST	No	Passed [0]	0x00,0x00
☑	ST_CDSP_WCDMA_TX_POWER_TEST	No	Passed [0]	0x00,0x00,0x01,0xE9
☑	ST_CDSP_GSM_TX_POWER_TEST	No	Passed [0]	0x00,0x00
☑	ST_CDSP_RX_PLL_PHASE_LOCK_TEST	No	Passed [0]	0x00,0x00,0x00,0x00
☑	ST_CDSP_TX_PLL_PHASE_LOCK_TEST	No	Passed [0]	0x00,0x00,0x00,0x00
☑	ST_CDSP_RX_IQ_LOOP_BACK_TEST	No	Passed [0]	0x00,0x00,0x74,0x9E
☑	ST_CDSP_PWR_DETECTOR_BIAS_TEST	No	Passed [0]	0x00,0x00,0x00,0x40
☑	ST_CDSP_RF_SUPPLY_TEST	No	Passed [0]	0x00
☑	ST_CDSP_TX_IQ_TEST	No	Passed [0]	0x00,0x00,0x03
☑	ST_CDSP_RF_BB_IF_TEST	No	Passed [0]	0x00,0x00,0x00,0x00
☐	ST_TAHVOINT_TEST	Yes	Passed [0]	
☐	ST_PWR_KEY_TEST	Yes	Not executed [3]	
☐	ST_SECURITY_TEST	Yes	Not executed [3]	
☐	ST_HOOKINT_TEST	No	Not executed [3]	

If one or more self tests show fail results (for example: “minor” or “fatal”) more detailed error codes can be read from the phone with “Details” button. Error codes are shown in hexadecimal format, but notice that all returned hexadecimal values are not necessarily useful in RF troubleshooting because some of the self tests return also different kind of measurement information together with “real” error codes. If self tests are not passed, please refer to following subchapters for detailed troubleshooting information.

IMPORTANT!

In order to use these self-tests most efficiently, it is very important that the tests are performed in certain order (or at least the error data is analyzed in this order). The tests are designed so that by performing them in this order it is easy to find the problematic component without any redundant checks. The following flowchart is based on that idea (i.e. if RFBUS fails, there is no need to spend time wondering why there is no power at TX).


RF SELFTEST FAILS
NO
It's not possible to get here...
YES
(86) ST_CDSP_RF_BB_IF_TEST FAILS
YES
Go to ST_CDSP_RF_BB_IF_TEST
NO
(83) ST_CDSP_RF_SUPPLY_IF_TEST FAILS FOR VINKU
YES
Go to ST_CDSP_RF_SUPPLY_TEST VINKU ERRORS
NO
(83) ST_CDSP_RF_SUPPLY_IF_TEST FAILS FOR HINKU
YES
Go to ST_CDSP_RF_SUPPLY_TEST HINKU ERRORS
NO
(85) ST_CDSP_TXIQ_TEST FAILS
YES
Go to ST_CDSP_TXIQ_TEST ERRORS
NO
(74) ST_CDSP_TXC_DATA_TEST FAILS
YES
Go to ST_CDSP_TXC_DATA_TEST ERRORS
NO
(82) ST_CDSP_POWER_DETECTOR _BIAS_TEST FAILS
YES
Go to ST_CDSP_POWER_DETECTOR_ BIAS_TEST ERRORS
NO
(79) ST_CDSP_RX_PLL_LOCK_TEST FAILS
YES
Go to ST_CDSP_RX_PLL_LOCK_TEST ERRORS
(80) ST_CDSP_TX_PLL_LOCK_TEST FAILS
YES
Go to ST_CDSP_TX_PLL_LOCK_TEST ERRORS
NO
(75) ST_CDSP_WCDMA_TX POWER_TEST FAILS
YES
Go to ST_CDSP_WCDMA_TX_POWER_ TEST ERRORS
NO
(81) ST_CDSP_RX_IQ_LOOP_BACK_TEST FAILS
YES
Go to ST_CDSP_RX_IQ LOOP_BACK ERRORS
(77) ST_CDSP_GSM_POWER_TEST FAILS
YES
Go to ST_CDSP_GSM_POWER_TEST ERRORS
NO
It's not possible to get here...

2.1 RF-BB interface (ST_CDSP_RF_BB_IF_TEST)

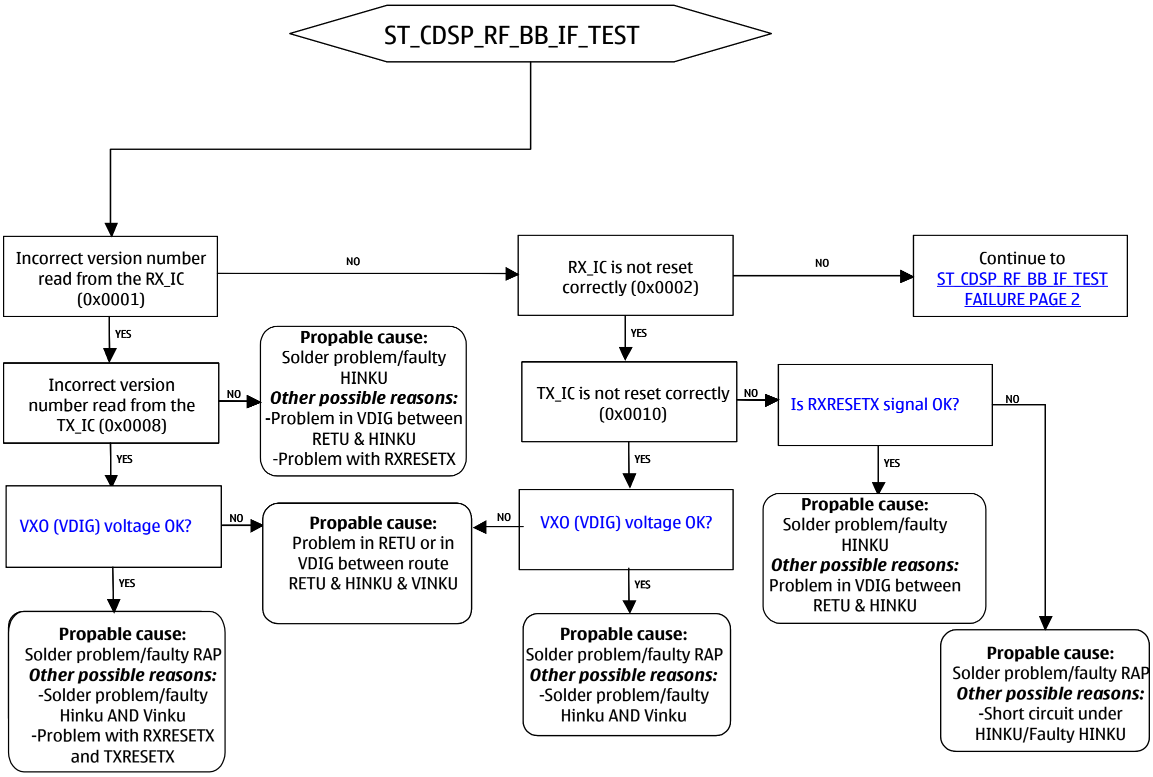
RF_BB_IF test (86) tests the functionality of the RAP3G/HINKU/VINKU serial interface & reset lines. If this test fails, it means that there's a problem programming Hinku and or Vinku and all of the following tests cannot give correct data.

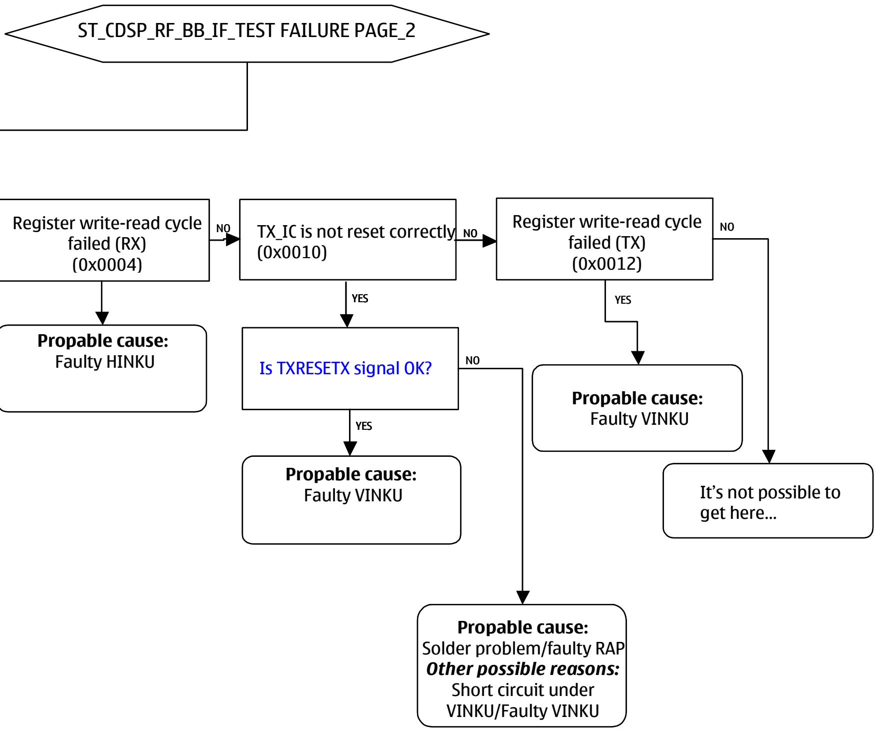
Tested signals: VBAT_ASIC, VDIG, VREF, VXO, RFBUSDAT, RFBUSCLK, RFBUSENA, RXRESETX, TXRESETX

Error code for this self test is given in format:

- *0xyy, 0xzz*

,where 0xyy, 0xzz part is the total error code: 0xyyzz


ST_CDSP_RF_BB_IF_TEST
Incorrect version number read from the RX_IC (0x0001)
NO
RX_IC is not reset correctly (0x0002)
NO
Continue to ST_CDSP_RF_BB_IF_TEST FAILURE PAGE 2
YES
Propable cause: Solder problem/faulty HINKU Other possible reasons: -Problem in VDIG between RETU & HINKU -Problem with RXRESETX
YES
Incorrect version number read from the TX_IC (0x0008)
NO
TX_IC is not reset correctly (0x0010)
NO
Is RXRESETX signal OK?
NO
YES
YES
YES
VXO (VDIG) voltage OK?
NO
Propable cause: Problem in RETU or in VDIG between route RETU & HINKU & VINKU
NO
VXO (VDIG) voltage OK?
Propable cause: Solder problem/faulty HINKU Other possible reasons: Problem in VDIG between RETU & HINKU
YES
YES
Propable cause: Solder problem/faulty RAP Other possible reasons: -Solder problem/faulty Hinku AND Vinku -Problem with RXRESETX and TXRESETX
Propable cause: Solder problem/faulty RAP Other possible reasons: -Solder problem/faulty Hinku AND Vinku
Propable cause: Solder problem/faulty RAP Other possible reasons: -Short circuit under HINKU/Faulty HINKU


ST_CDSP_RF_BB_IF_TEST FAILURE PAGE_2
Incorrect version number read from the TX_IC (0x0008)
NO
YES
Propable cause: Poor solder/faulty Vinku Other possible reasons: VDIG connection between RETU & VINKU
Register write-read cycle failed (RX) (0x0004)
NO
Propable cause: Faulty HINKU
TX_IC is not reset correctly (0x0010)
NO
YES
Is TXRESETX signal OK?
NO
YES
Propable cause: Faulty VINKU
Propable cause: Solder problem/faulty RAP Other possible reasons: Short circuit under VINKU/Faulty VINKU
Register write-read cycle failed (TX) (0x0012)
NO
YES
Propable cause: Faulty VINKU
It's not possible to get here...

Please, refer to chapter Error Code Interpretation Examples if more information about error code interpretation is needed.

2.2 Supply test for Hinku and Vinku (ST_CDSP_RF_SUPPLY_TEST)

This self test includes two different RF-supply self tests...one for Vinku and one for Hinku:

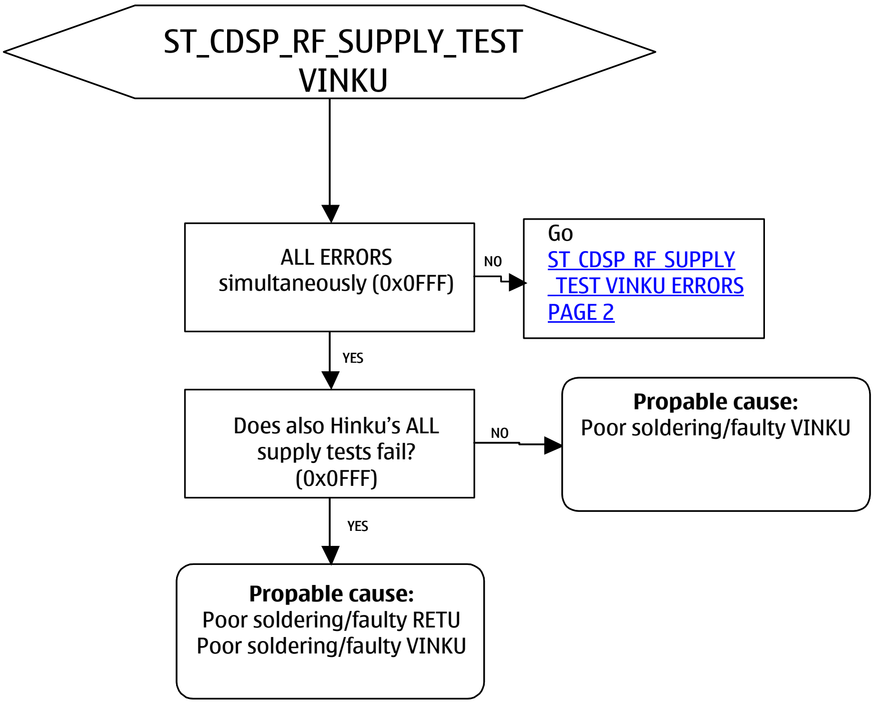
RF_SUPPLY_TEST (VINKU) (83) tests the functionality of Vinku's bias block, regulators, reference voltage line and, supply connections.
If these fail, all other Vinku tests can/will fail. Also many Hinku tests can be affected and can't be trusted.

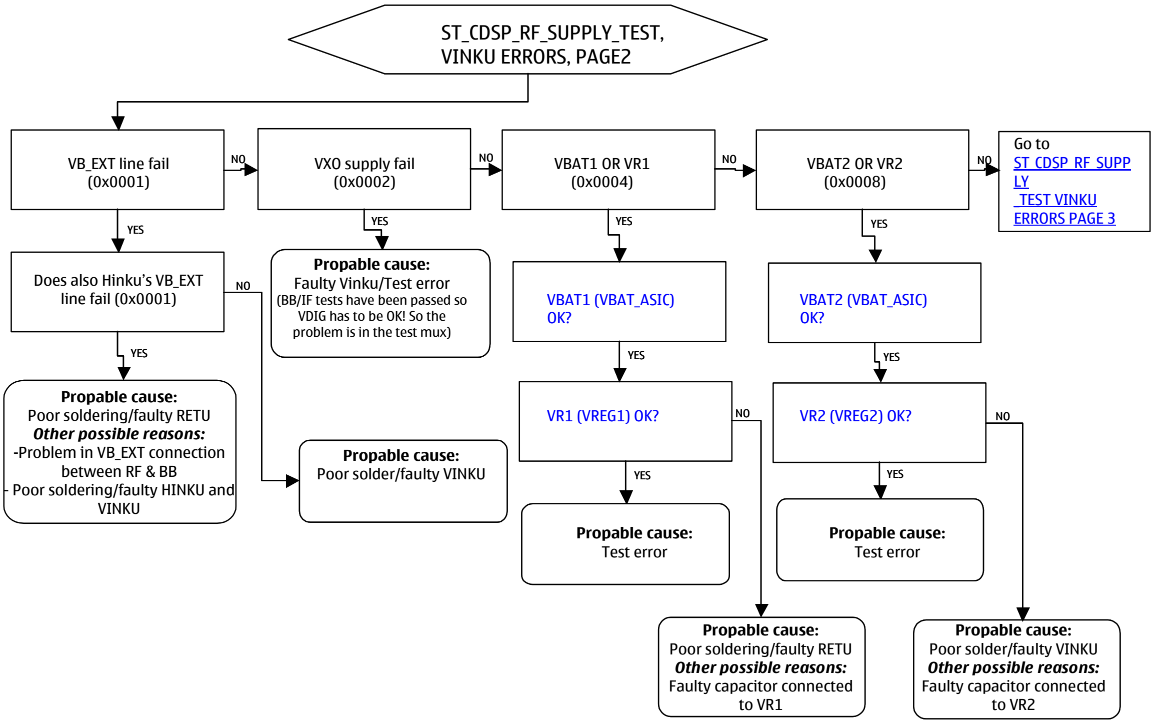
RF_SUPPLY_TEST (HINKU) (83) tests the functionality of Hinku's bias block, regulators, reference voltage line and, supply connections.
If these fail, all other Hinku tests can/will fail and can't be trusted.
Error code for this self test is given in format:

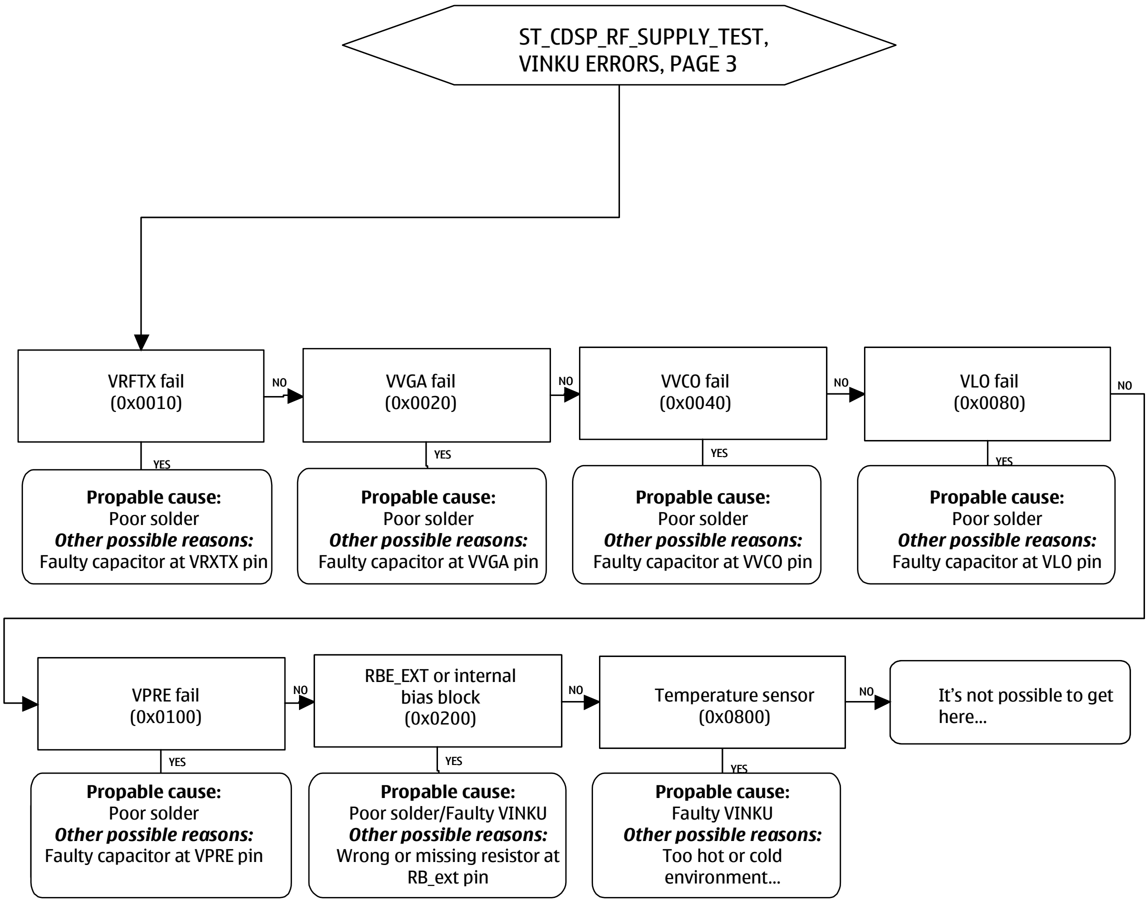
- *0xyy, 0xyy, 0xzz, 0xzz, MeasResult1, MeasResult2, ...*

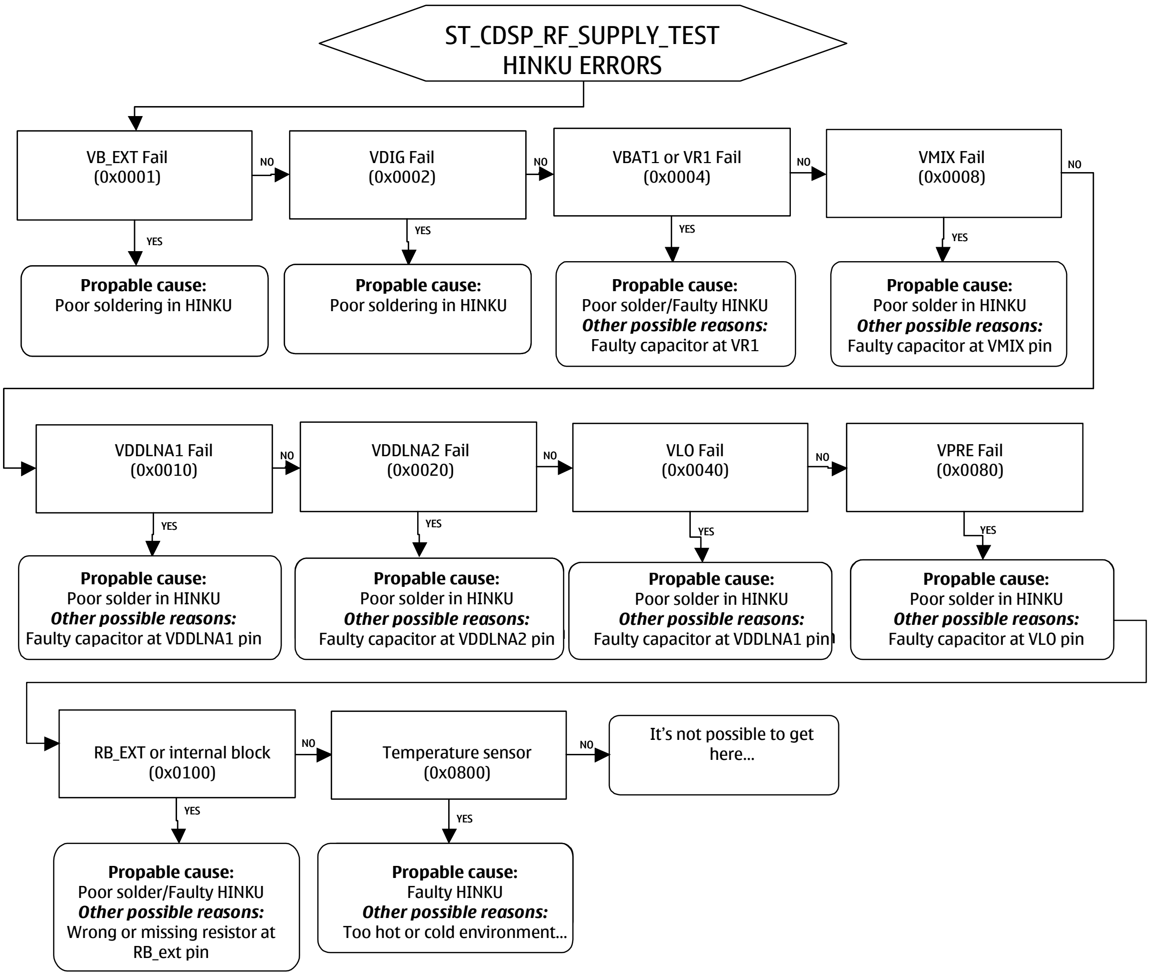
,where 0xyy, 0xyy part is the main part of the error code for Vinku TX ASIC: 0xyyyy

and 0xzz, 0xzz is the main part of the error code for Hinku TX ASIC: 0xzzzz


ST_CDSP_RF_SUPPLY_TEST
VINKU
ALL ERRORS
simultaneously (0x0FFF)
NO
Go
ST_CDSP_RF_SUPPLY_TEST VINKU ERRORS PAGE 2
YES
Does also Hinku's ALL supply tests fail? (0x0FFF)
NO
Propable cause:
Poor soldering/faulty VINKU
YES
Propable cause:
Poor soldering/faulty RETU
Poor soldering/faulty VINKU


ST_CDSP_RF_SUPPLY_TEST,
VINKU ERRORS, PAGE2
VB_EXT line fail (0x0001)
NO
VXO supply fail (0x0002)
NO
VBAT1 OR VR1 (0x0004)
NO
VBAT2 OR VR2 (0x0008)
NO
Go to ST_CDSP_RF_SUPPLY _TEST VINKU ERRORS PAGE 3
YES
Does also Hinku's VB_EXT line fail (0x0001)
NO
YES
Propable cause: Faulty Vinku/Test error (BB/IF tests have been passed so VDIG has to be OK! So the problem is in the test mux)
YES
VBAT1 (VBAT_ASIC) OK?
YES
VBAT2 (VBAT_ASIC) OK?
YES
Propable cause: Poor soldering/faulty RETU Other possible reasons: -Problem in VB_EXT connection between RF & BB - Poor soldering/faulty HINKU and VINKU
Propable cause: Poor solder/faulty VINKU
YES
VR1 (VREG1) OK?
NO
YES
VR2 (VREG2) OK?
NO
YES
Propable cause: Test error
YES
Propable cause: Test error
Propable cause: Poor soldering/faulty RETU Other possible reasons: Faulty capacitor connected to VR1
Propable cause: Poor solder/faulty VINKU Other possible reasons: Faulty capacitor connected to VR2


ST_CDSP_RF_SUPPLY_TEST, VINKU ERRORS, PAGE 3
VRFTX fail (0x0010)
NO
VVGA fail (0x0020)
NO
VVCO fail (0x0040)
NO
VLO fail (0x0080)
NO
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VRXTX pin
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VVGA pin
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VVCO pin
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VLO pin
VPRE fail (0x0100)
NO
RBE_EXT or internal bias block (0x0200)
NO
Temperature sensor (0x0800)
NO
It's not possible to get here...
YES
Propable cause: Poor solder Other possible reasons: Faulty capacitor at VPRE pin
YES
Propable cause: Poor solder/Faulty VINKU Other possible reasons: Wrong or missing resistor at RB_ext pin
YES
Propable cause: Faulty VINKU Other possible reasons: Too hot or cold environment...


ST_CDSP_RF_SUPPLY_TEST
HINKU ERRORS
VB_EXT Fail
(0x0001)
NO
VDIG Fail
(0x0002)
NO
VBAT1 or VR1 Fail
(0x0004)
NO
VMIX Fail
(0x0008)
NO
YES
Propable cause:
Poor soldering in HINKU
YES
Propable cause:
Poor soldering in HINKU
YES
Propable cause:
Poor solder/Faulty HINKU
Other possible reasons:
Faulty capacitor at VR1
YES
Propable cause:
Poor solder in HINKU
Other possible reasons:
Faulty capacitor at VMIX pin
VDDLNA1 Fail
(0x0010)
NO
VDDLNA2 Fail
(0x0020)
NO
VLO Fail
(0x0040)
NO
VPRE Fail
(0x0080)
YES
Propable cause:
Poor solder in HINKU
Other possible reasons:
Faulty capacitor at VDDLNA1 pin
YES
Propable cause:
Poor solder in HINKU
Other possible reasons:
Faulty capacitor at VDDLNA2 pin
YES
Propable cause:
Poor solder in HINKU
Other possible reasons:
Faulty capacitor at VDDLNA1 pin
YES
Propable cause:
Poor solder in HINKU
Other possible reasons:
Faulty capacitor at VLO pin
RB_EXT or internal block
(0x0100)
NO
Temperature sensor
(0x0800)
NO
It's not possible to get here...
YES
Propable cause:
Poor solder/Faulty HINKU
Other possible reasons:
Wrong or missing resistor at RB_ext pin
YES
Propable cause:
Faulty HINKU
Other possible reasons:
Too hot or cold environment...

Please, refer to chapter Error Code Interpretation Examples if more information about error code interpretation is needed.

2.3 TX IQ self test (ST_CDSP_TX_IQ_TEST)

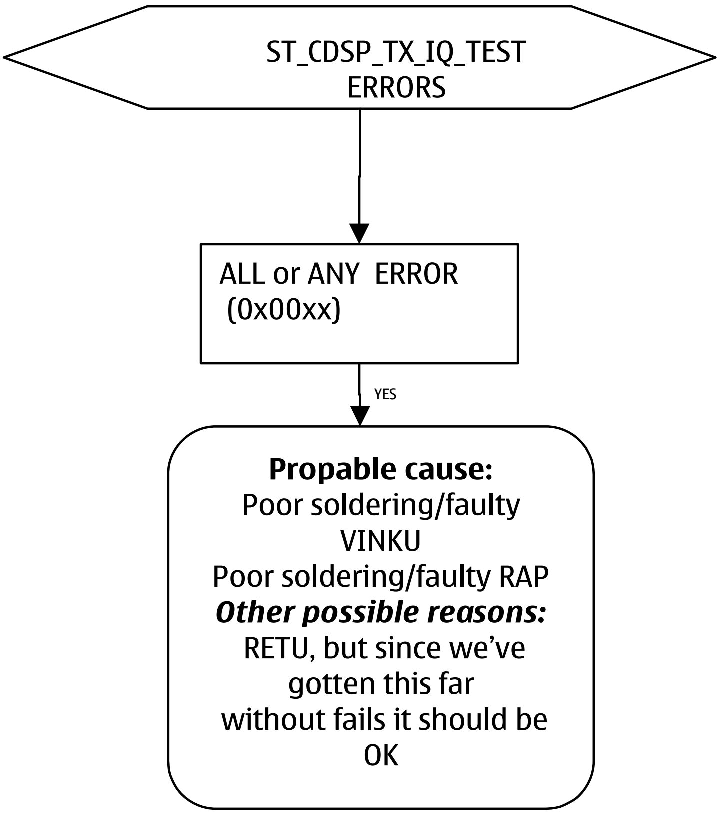
TX_IQ_TEST (85) checks that the TXIQ lines between RAP & Vinku are properly connected. If this fails also power tests and RXIQ loopback will fail.

Tested signals: VBAT_ASIC, TXIP, TXIQ, TXQP, TXQN, DAC_REF1, RFBUS

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, ...*

,where 0xyy, 0xzz is the main part of the error code: 0xyyzz



Propable cause:
Poor soldering/faulty VINKU
Poor soldering/faulty RAP
Other possible reasons:
RETU, but since we've gotten this far without fails it should be OK

2.4 TXC Data test (ST_TXC_DATA_TEST)

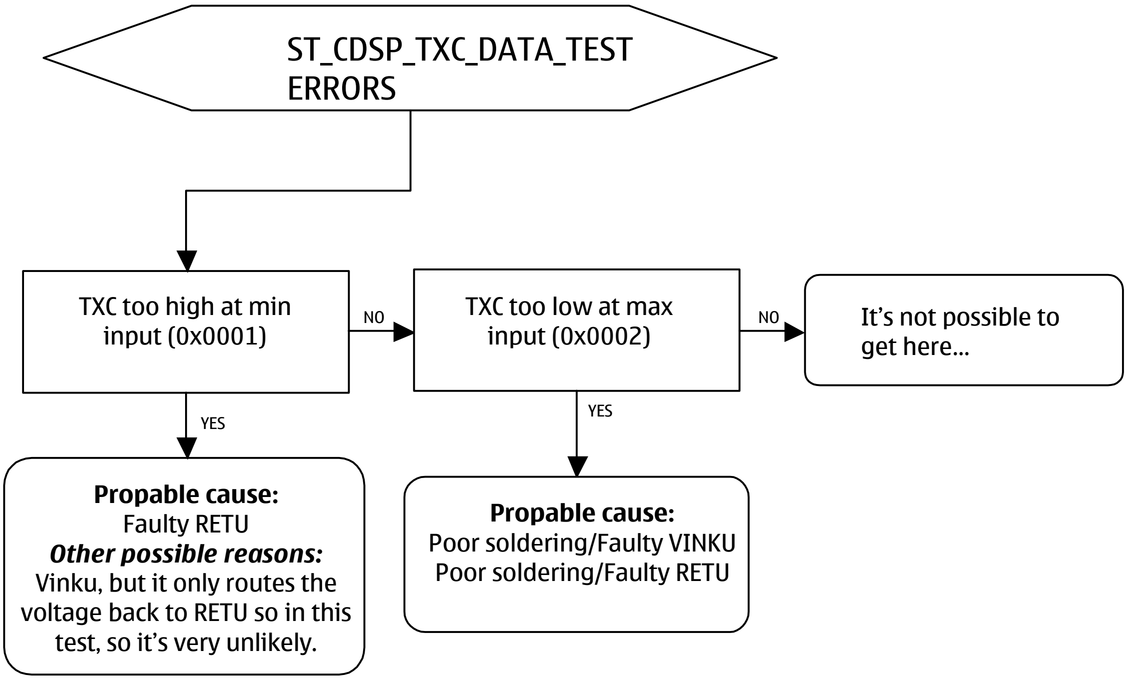
TXC_DATA_TEST (74) tests that the TXC line between RETU & VINKU is properly connected. If this fails also TX power tests will fail.

Test covers: TxC power control signal, Retu (N2200), RFBUS, Vinku (N7501), VBAT_ASIC

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, ...*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_TXC_DATA_TEST ERRORS
TXC too high at min input (0x0001)
NO
TXC too low at max input (0x0002)
NO
It's not possible to get here...
YES
YES
Propable cause:
Faulty RETU
Other possible reasons:
Vinku, but it only routes the voltage back to RETU so in this test, so it's very unlikely.
Propable cause:
Poor soldering/Faulty VINKU
Poor soldering/Faulty RETU

2.5 WCDMA power detector biasing self test (ST_CDSP_PWR_DETECTOR_BIAS_TEST)

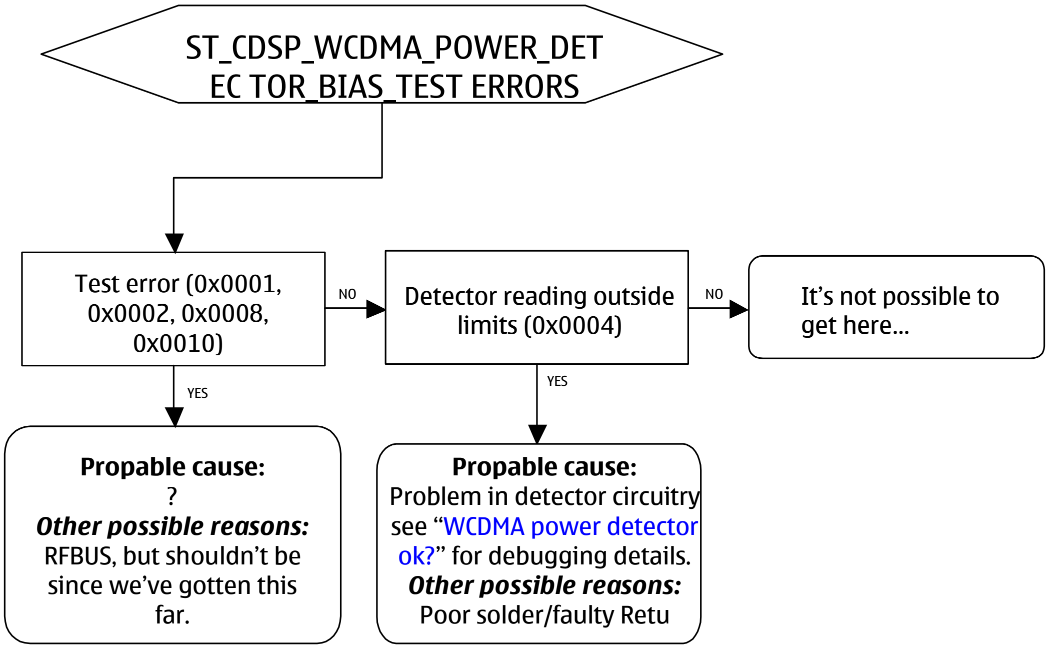
POWER_DETECTOR_BIAS_TEST (82) tests the biasing of the power detector.
If this fails, also the power tests will fail/can't be trusted.

Test covers: Vinku (N7501) WCDMA power detector biasing circuit functionality, Retu (N2200) WTXDET input. RFBUS, VBAT_ASIC

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_WCDMA_POWER_DET EC TOR_BIAS_TEST ERRORS
Test error (0x0001, 0x0002, 0x0008, 0x0010)
NO
Detector reading outside limits (0x0004)
NO
It's not possible to get here...
YES
YES
Propable cause:
?
Other possible reasons:
RFBUS, but shouldn't be since we've gotten this far.
Propable cause:
Problem in detector circuitry see "WCDMA power detector ok?" for debugging details.
Other possible reasons:
Poor solder/faulty Retu

Please, refer to chapter Error Code Interpretation Examples if more information about error code interpretation is needed.

2.5.1 WCDMA power detector ok?

Follow these instructions if it's needed to check WCDMA power detector functionality. Please notice that WCDMA power detector is used only in maximum TX power limiting and WCDMA PA supply voltage controlling purposes.

- WCDMA transmitter has to be active before measurements. Procedure is explained in chapter "Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7531.
- WTXDET signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- WTXDET should be about 325 mV with power level +10 dBm, about 1.03 V with power level +21 dBm and about 150 mV when power levels below 0 dBm are used.
- **NOTICE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.**
- If WTXDET –signal is not as expected follow the same troubleshooting instructions as in: Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

2.6 RX PLL phase lock self test (ST_CDSP_RX_PLL_PHASE_LOCK_TEST)

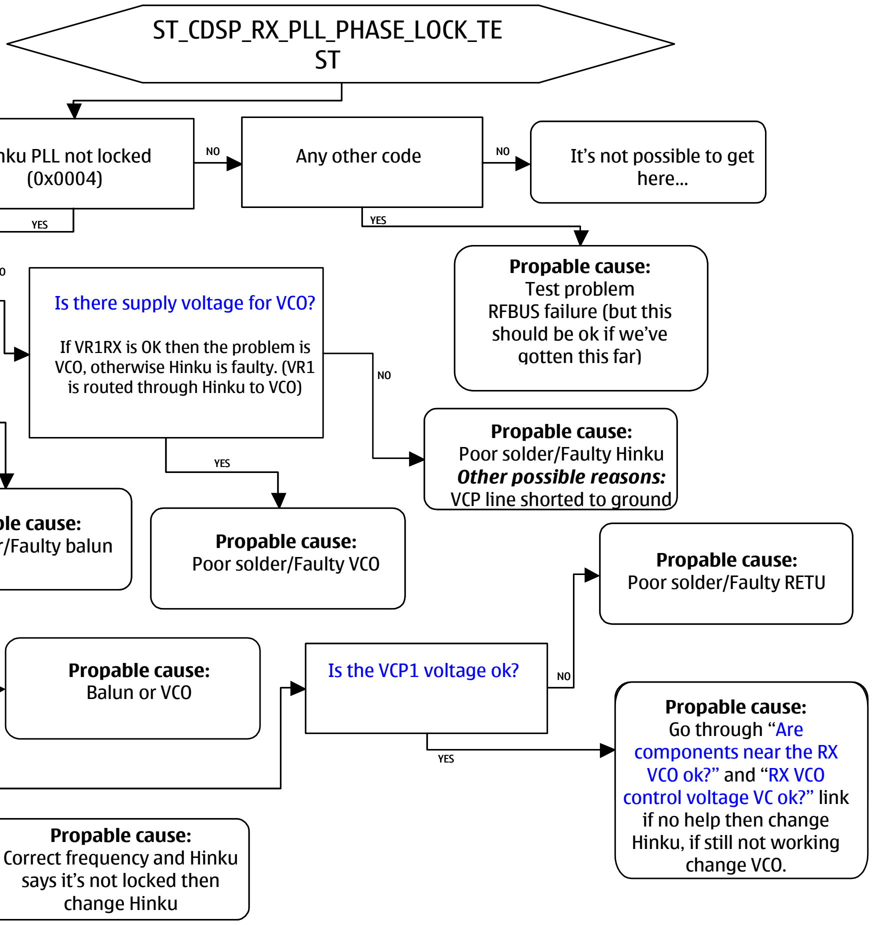
RX_PLL_LOCK_TEST (79) tests the functionality of RX PLL. If this fails, none of the RX related measurements cannot be trusted.

Tested signals: VBAT_ASIC, VDIG, VR1, VR1RX, VRCP1, RFBUSDAT, RFBUSCLK, RFBUSENA, RXRESETX

Error code for this self test is given in format:

- *0xyy, 0xzz*

,where 0xyy, 0xzz part is the total error code: 0xyyzz


ST_CDSP_RX_PLL_PHASE_LOCK_TEST
Hinku PLL not locked (0x0004)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
Is there RF power at VCO output?
NO
Is there supply voltage for VCO?
If VR1RX is OK then the problem is VCO, otherwise Hinku is faulty. (VR1 is routed through Hinku to VCO)
YES
NO
Is there RF power at Hinku input?
NO
Propable cause: Poor solder/Faulty Hinku Other possible reasons: VCP line shorted to ground
YES
YES
Propable cause: Poor solder/Faulty balun
Propable cause: Poor solder/Faulty VCO
Propable cause: Poor solder/Faulty RETU
Is there ENOUGH RF power at Hinku input?
NO
Propable cause: Balun or VCO
Is the VCP1 voltage ok?
NO
YES
Propable cause: Go through "Are components near the RX VCO ok?" and "RX VCO control voltage VC ok?" link if no help then change Hinku, if still not working change VCO.
YES
Is the RX VCO frequency correct?
NO
YES
Propable cause: Correct frequency and Hinku says it's not locked then change Hinku

2.7 TX PLL phase lock self test (ST_CDSP_TX_PLL_PHASE_LOCK_TEST)

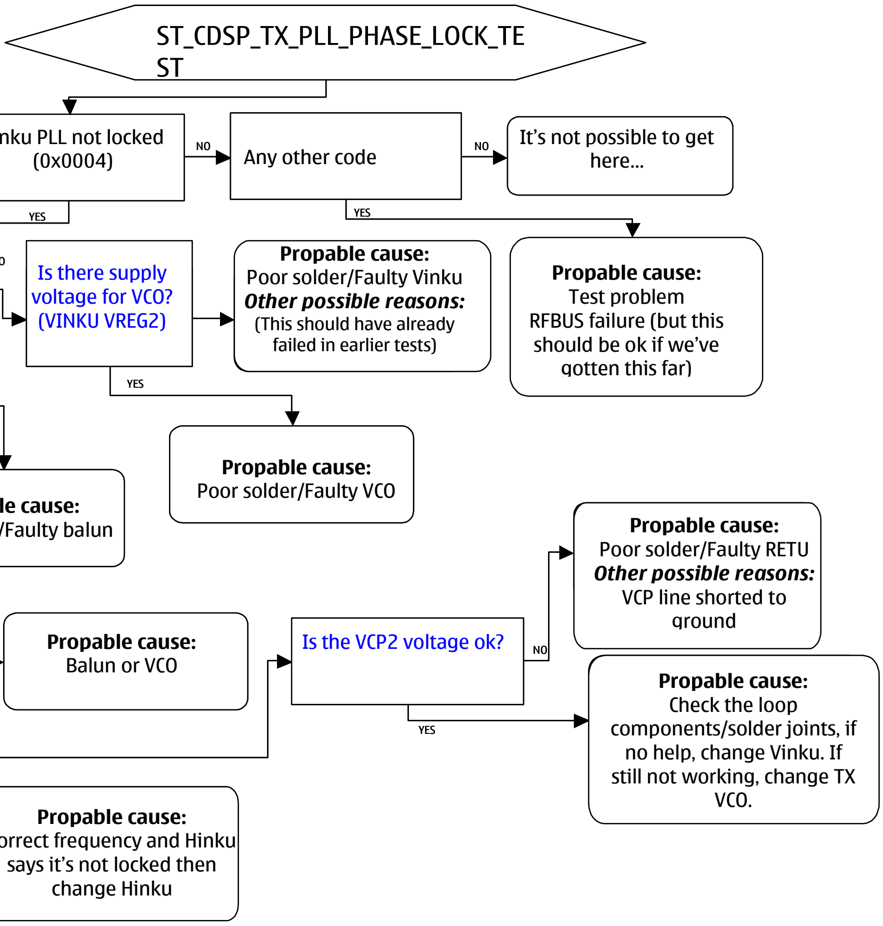
TX_PLL_LOCK_TEST (80) tests the functionality of RX PLL. If this fails also the TX power tests will fail.

Tested signals: VBAT_ASIC, VDIG, VR1, VRCP2, RFBUSDAT, RFBUSCLK, RFBUSENA, TXRESETX

Error code for this self test is given in format:

- *0xyy, 0xzz*

,where 0xyy, 0xzz part is the total error code: 0xyyzz


ST_CDSP_TX_PLL_PHASE_LOCK_TEST
Vinku PLL not locked (0x0004)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Is there RF power at VCO output?
NO
Is there supply voltage for VCO? (VINKU VREG2)
Propable cause: Poor solder/Faulty Vinku Other possible reasons: (This should have already failed in earlier tests)
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
YES
Is there RF power at Vinku input?
NO
YES
Propable cause: Poor solder/Faulty VCO
YES
Propable cause: Poor solder/Faulty balun
Propable cause: Poor solder/Faulty RETU Other possible reasons: VCP line shorted to ground
Is there ENOUGH RF power at Vinku input?
NO
Propable cause: Balun or VCO
Is the VCP2 voltage ok?
NO
YES
YES
Propable cause: Check the loop components/solder joints, if no help, change Vinku. If still not working, change TX VCO.
Is the TX VCO frequency correct?
NO
YES
Propable cause: Correct frequency and Hinku says it's not locked then change Hinku

2.8 WCDMA transmitter self test (ST_CDSP_WCDMA_TX_POWER_TEST)

TX_WCDMA_POWER_TEST (75) checks the output power of the WCDMA transmitter.

Test covers: Modulator, Vinku (N7501) IC gain stages, IC output supply components, TX filter, WCDMA PA (N7503), DCDC-converter (N7504), RFBUS, VBAT_ASIC, VBAT_PA

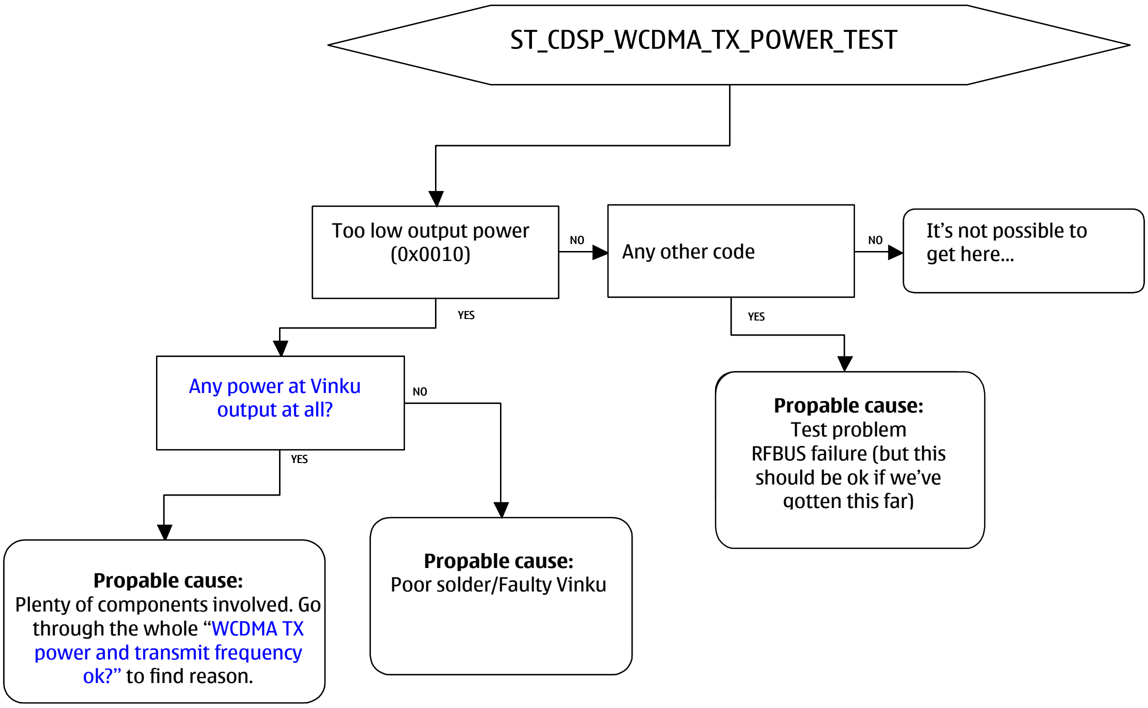
Test does not cover: Circulator (Z7505), duplexer (Z7502), and antenna

To prevent network interference, the phone must be in an RF shield box, when this test is run!

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_WCDMA_TX_POWER_TEST
Too low output power (0x0010)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Any power at Vinku output at all?
NO
YES
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
Propable cause: Poor solder/Faulty Vinku
Propable cause: Plenty of components involved. Go through the whole "WCDMA TX power and transmit frequency ok?" to find reason.

2.9 RX IQ loop back self test (ST_CDSP_RX_IQ_LOOP_BACK_TEST)

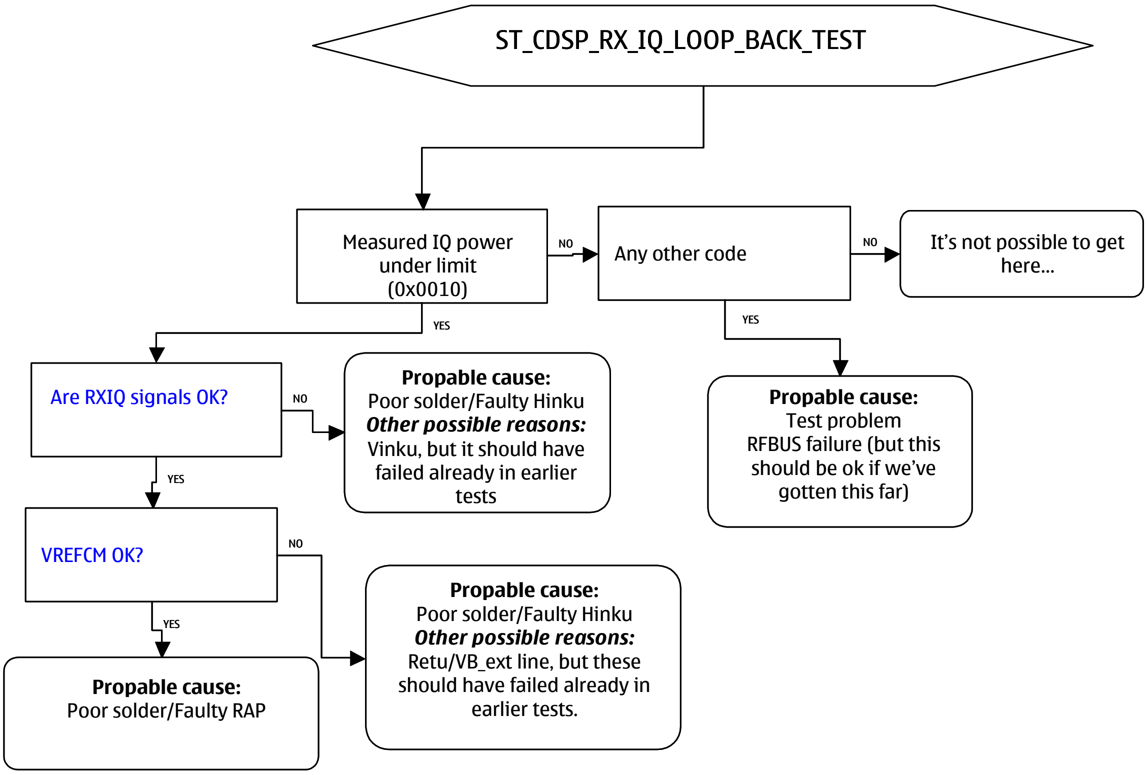
RX_IQ_LOOPBACK (81) tests that the RXI lines & VREFCM line between RAP & HINKU are connected.

Tested signals: VBAT_ASIC, RXQP, RXQN, RXIP, RXIN, VREFCM, TXIP, TXIN, RFBUS

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_RX_IQ_LOOP_BACK_TEST
Measured IQ power under limit (0x0010)
NO
Any other code
NO
It's not possible to get here...
YES
YES
Are RXIQ signals OK?
NO
Propable cause: Poor solder/Faulty Hinku Other possible reasons: Vinku, but it should have failed already in earlier tests
Propable cause: Test problem RFBUS failure (but this should be ok if we've gotten this far)
YES
VREFCM OK?
NO
YES
Propable cause: Poor solder/Faulty Hinku Other possible reasons: Retu/VB_ext line, but these should have failed already in earlier tests.
Propable cause: Poor solder/Faulty RAP

2.10 GSM transmitter self test (ST_CDSP_GSM_TX_POWER_TEST)

TX_GSM_POWER_TEST (77) checks the output power of the GSM transmitter.

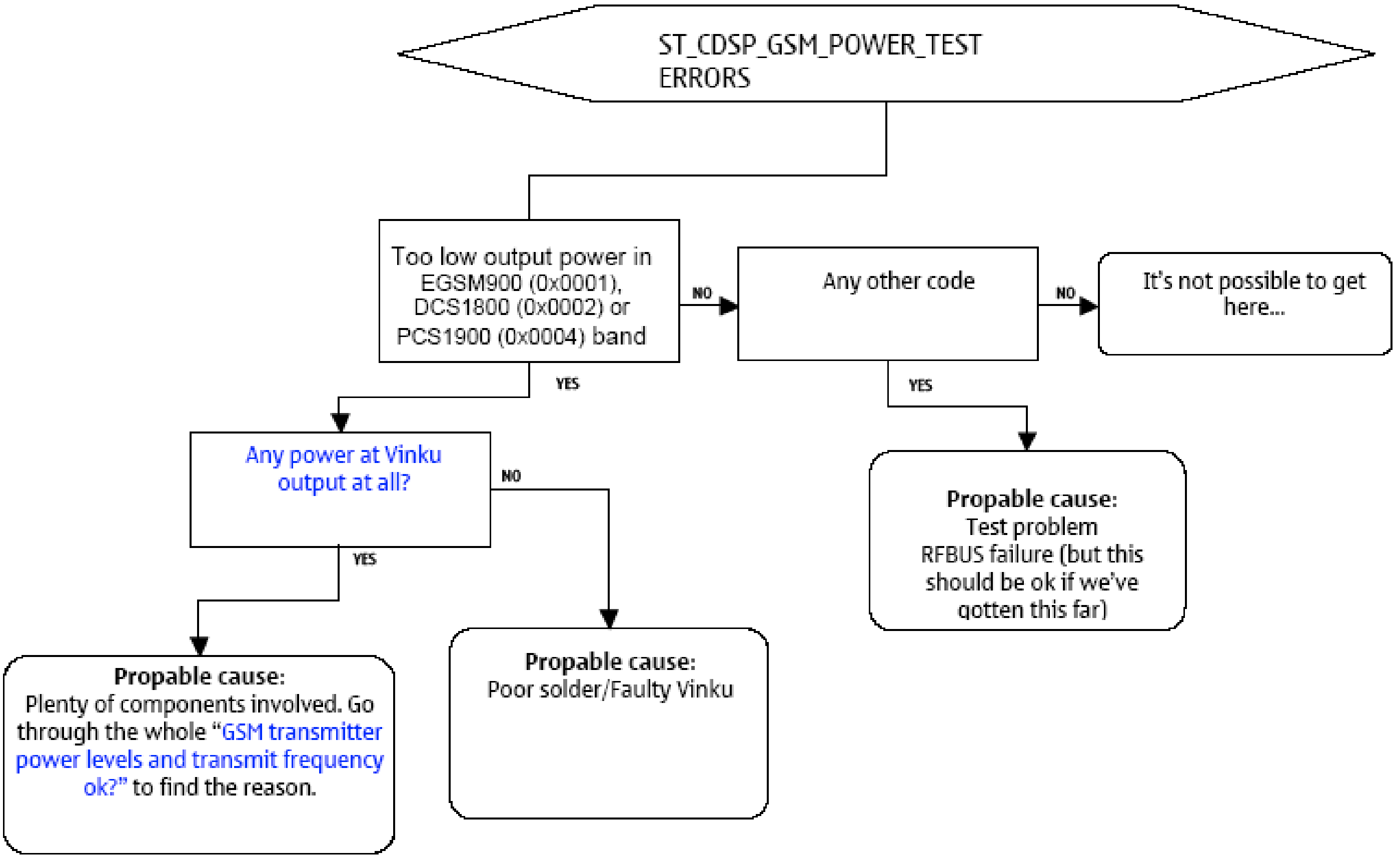
Test covers: RFIC Vinku (N7501), modulator, IC gain control stages, filter/balun solder joints, GSM PA (N7502), PA bias lines & DACs, RFBUS, TX power detector functionality, VBAT_ASIC, VBAT_PA.

Test does not cover: Antenna functionality, RX/TX-switch functionality, and TX signal quality

Error code for this self test is given in format:

- *0xyy, 0xzz, MeasResult1, MeasResult2, ...*

,where 0xyy, 0xzz part is the main part of the error code: 0xyyzz


ST_CDSP_GSM_POWER_TEST
ERRORS
Too low output power in EGSM900 (0x0001), DCS1800 (0x0002) or PCS1900 (0x0004) band
NO
Any other code
NO
It's not possible to get here...
YES
YES
Any power at Vinku output at all?
NO
YES
Propable cause:
Test problem
RFBUS failure (but this should be ok if we've gotten this far)
Propable cause:
Plenty of components involved. Go through the whole "GSM transmitter power levels and transmit frequency ok?" to find the reason.
Propable cause:
Poor solder/Faulty Vinku

2.11 Error Code Interpretation Examples

This section presents three different examples of RF error code interpretation.

2.11.1 Example 1

ST_CDSP_RX_PLL_PHASE_LOCK self test gives “Fatal” result with error code: 0x00, 0x04

This means that the total error code is “0x004” (“0000 0000 0000 0100” in binary format) and if we look a flowchart in section RX PLL phase lock self test (ST_CDSP_RX_PLL_PHASE_LOCK_TEST) the meaning for the code is *“Hinku PLL is not locked”*.

2.11.2 Example 2

Some of the self-tests can return multiple errors at the same time.

For example: RF-BB interface (ST_CDSP_RF_BB_IF_TEST) self test gives “Fatal” result with error code: 0x00, 0x09, ...

This means that the total error code without measurement values is “0x0009” and this is the same as “0000 0000 0000 1001” in binary format. If we look closer there are multiple errors (2) found:

Bit mask “---- ---- ---- ---1” = “0x0001”

Bit mask “---- ---- ---- 1---“ = “0x0008”

Troubleshooting can be continued with RF-BB interface (ST_CDSP_RF_BB_IF_TEST) flowchart because there are errors with two error codes: 0x0001 and 0x0008.

2.11.3 Example 3

Supply test for Hinku and Vinku (ST_CDSP_RF_SUPPLY_TEST) is slightly different self test from others because there are both Vinku and Hinku errors shown in the same error code (*The format for error code is explained in section Supply test for Hinku and Vinku*).

For example: ST_CDSP_RF_SUPPLY_TEST gives “Fatal” result with error code: 0x0B, 0xBC, 0x00, 0x00, ...

This error code means that there are probably no errors in Hinku RX ASIC supply voltages because the main part of the error code for Hinku is 0x00, 0x00 (=0x0000) and means the same as “no errors”.

Anyway, there are many errors with Vinku TX ASIC supply voltages. The main part of the error code for Vinku is 0x0B, 0xBC and that’s the same as “101110111100” in binary format. If we look closer there are multiple (8) errors found:

Bit mask “---- ---- ---- -1--“ = “0x0004”

Bit mask “---- ---- ---- 1---“ = “0x0008”

Bit mask “---- ---- ---1 ----“ = “0x0010”

Bit mask “---- ---- --1- ----“ = “0x0020”

Bit mask “---- ---- 1--- ----“ = ”0x0080”

Bit mask “---- ---1 ---- ----“ = “0x0100”

Bit mask “---- --1- ---- ----“ = ”0x0200”

Bit mask “---- 1--- ---- ----“ = ”0x0800”

Troubleshooting can be continued with ST_CDSP_RF_SUPPLY_TEST VINKU flowchart because there are errors with eight VINKU error codes.

Typically this kind of error occurs if there is no VBAT_ASIC voltage coming to the Vinku TX ASIC at all or the ASIC is poorly soldered to the PWB (All voltages that are somehow related to VBAT_ASIC are causing errors).

3. DOES THE PHONE REGISTER TO THE NETWORK AND MAKE A CALL (GSM)?

- Test against a GSM communication tester.

3.1 GSM transmitter power levels and transmit frequency ok?

- Attach the phone to the product specific test jig and a spectrum analyser to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- Set GSM Tx ON. Procedure is explained in section “Transmitter troubleshooting”.
- Spectrum analyser centre frequency should be set according the used TX channel (See section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 1 MHz, Span 0 MHz, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Test at least the maximum and minimum power levels:

- EGSM900: The maximum power level is “5” (31 – 34 dBm, typ. value +33 dBm)

  The minimum power level is “19” (3 – 7 dBm, typ. value +5 dBm)

- GSM1800: The maximum power level is “0” (28 – 32 dBm, typ. value +30 dBm)

  The minimum power level is “15” (-2 - +2 dBm, typ. value +0 dBm)

- GSM1900: The maximum power level is “0” (28 – 32 dBm, typ. value +30 dBm)

  The minimum power level is “15” (-2 - +2 dBm, typ. value +0 dBm)

- If power is not as expected separate the phone into parts and place to the module jig. Connect the spectrum analyser to the module jig GSM RF connector and measure power levels again (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN.. Make sure that all connections are made to the correct RF-connector*).

- Power levels ok in the module jig: Antenna or antenna connection bad. Replace the antenna
- Power levels still wrong or no TX signal found at all: Continue troubleshooting

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If the signal is found to be on wrong frequency or frequency is not stabile, see section 3.1.3. "GSM transmitter frequency correct".

3.1.1 Does GSM TX transmit RF-power at all?

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency or frequency is not stabile, see section, 3.1.3. "GSM transmitter frequency correct".

3.1.1.1 Is Vinku (N7501) transmitting RF-power at all?

- GSM transmitter has to be active before Vinku's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900:

- Connect the RF probe to Z7504 input. The level should be about the same on both input pins. Check output level with at least the maximum (5) and the minimum (19) power levels.
- Maximum power level – Output level should be about -15...-25 dBm
- Minimum power level – Output level should be about -45...-55 dBm

- GSM1800/GSM1900:

- Connect the RF probe to the inputs of T7502 (pins 3 and 4). The level should be about the same on both pins. Check output level with at least the maximum (0) and the minimum (15) power levels.
- Maximum power level – Output level should be about -25...-35 dBm
- Minimum power level – Output level should be about -55...-65 dBm

- Check if output levels of Vinku are as expected.
- **NOTE! If VINKU output RF-power is totally missing just in one or two GSM-bands, typically this means that Vinku ASIC (N7501) is faulty or the ASIC is badly soldered. For example: VINKU is not transmitting at all in EGSM900-band but TX-power is ok in other GSM-bands. However, N7501 is not replaceable. The whole PWB should be replaced.**

3.1.1.1.1 Vinku (N7501) regulator voltages VREG1, VREG2 ok?

- GSM transmitter has to be active before VREG1 and VREG2 voltages can be measured. Procedure is explained in section "Transmitter troubleshooting."
- Measurements can be done with an oscilloscope and a probe.
- VREG1: This point is not accessible.
- VREG2: Connect the probe to C7554 (or C7555).

- VREG1 and VREG2 voltage levels should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.1.1.1.1.1 Vinku (N7501) RB_EXT voltage ok?

- This point not accessible.

3.1.1.1.1.1.1 VREF-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R2200, the side opposite to C2202.
- VREF voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

3.1.1.1.1.2 Are capacitors in Vinku (N7501) regulator lines working correctly?

VREG2: C7547, C7548, C7554, C7555, C7553, C7552, C7558 and C7567

- Only C7554 and C7555 are accessible.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that regulator lines are not short-circuited to the ground. If short-circuit is found replace the accessible capacitors mentioned above. If this does not help go to the next step.

3.1.1.1.1.3 TX VCO (G7502) ok?

3.1.1.1.2 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

3.1.1.1.2.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 accessible.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

3.1.1.1.2.2 Replace Retu

3.1.1.1.3 VRCP2-voltage ok?

- GSM transmitter has to be active before VRCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221.
- VRCP2 voltage should be about 4.75 V.

3.1.1.1.3.1 C7550 and C2221 working correctly?

- C7550 is not accessible.
- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VRCP2-line is short-circuited to the ground. If short-circuit is found replace C2221. If this does not help go to the next steps.

3.1.1.1.3.2 Retu ok?

3.1.1.1.4 Is there RF power in the TX VCO output at all?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done also without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The correct VCO frequency can be found in section "Frequency mappings". The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.1.1.4.1 TX VCO operating voltage VREG2 (VR2) ok?

- See section "Vinku (N7501) regulator voltages VREG1, VREG2 ok?"

3.1.1.1.4.2 Replace TX VCO (G7502)

3.1.1.1.5 Is TX VCO RF-signal coming to the Vinku at all?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre

frequency should be set according the used TX channel (see section "Frequency mappings").

- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.1.1.5.1 Replace balun T7503

3.1.1.1.6 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3. "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.1.1.1.6.1 Retu ok?

3.1.1.1.7 VCTCXO frequency and output level correct?

- Only VCTCXO frequency can be verified.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C6030.
- The frequency of the VCTCXO should be quite exactly 38.4 MHz.

3.1.1.1.7.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

3.1.1.1.7.1.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 accessible.
- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C7560, C7513, C7526 and C2214 (Note: only C2214 replaceable). If replacing does not help then go to the next steps.

3.1.1.1.7.1.2 Replace Retu

3.1.1.1.7.2 BB AFC-voltage ok?

- See section "BB AFC-voltage ok?"

3.1.1.1.8 This board is not reworkable because of a fault under the Hinku/Vinku soldered down shield.

3.1.1.2 Is there RF-power in the GSM PA (N7502) input at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to the output of Z7504. The RF level should be roughly -15...-20 dBm.
- GSM1800 or GSM1900: Connect the probe to R7513 output. The RF level should be roughly -20...-30 dBm.

3.1.1.2.1 EGSM900: Replace SAW Z7504

3.1.1.2.2 GSM1800/GSM1900: Is Vinku (N7501) output RF-signal coming to the T7502 (Balun)?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting". Set TX power level to the maximum ("0" in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to T7502 input. There are two input ports in T7502 because the input port is balanced. The RF level should be roughly -25 dBm in both inputs.

3.1.1.2.3 GSM1800/GSM1900: Is there RF power in the balun (T7502) output at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting". Set TX power level to the maximum ("0" in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering

needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- GSM1800 or GSM1900: Connect the probe to R7513 input. The RF level should be roughly -20...-30 dBm.

3.1.1.2.3.1 Replace balun T7502

3.1.1.2.4 GSM1800/GSM1900: Replace attenuator R7512

3.1.1.3 Does GSM PA (N7502) transmit RF-power at all?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the **minimum** ("19" in EGSM900 and "15" in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to the pin 11 of Z7503. The RF level should be about -16...-17 dBm.
- GSM1800 or GSM1900: Connect the pin 13 of Z7503. The RF level should be roughly -29...-30 dBm in both bands.

3.1.1.3.1 GSM PA (N7502) operating voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7593
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V

3.1.1.3.1.1 PA operating voltage VBAT_PA ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.1.3.1.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.1.3.1.2 C7593 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

3.1.1.3.1.3 Replace inductor L7516

- If replacing does not help, replace GSM PA (N7502)

3.1.1.3.2 Are bias currents coming correctly to the GSM PA (N7502)?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:
    - Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
    - Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 "Icont_21/Icont_22 (DC offset 1.2V)" when measured with an oscilloscope and a probe. Check both currents.
- GSM1800 or GSM1900:
    - Connect the probe to C7561 or C7556.
    - Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 when measured with an oscilloscope and a probe. Check both currents.

3.1.1.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.1.1.3.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing – Replace Vinku

Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

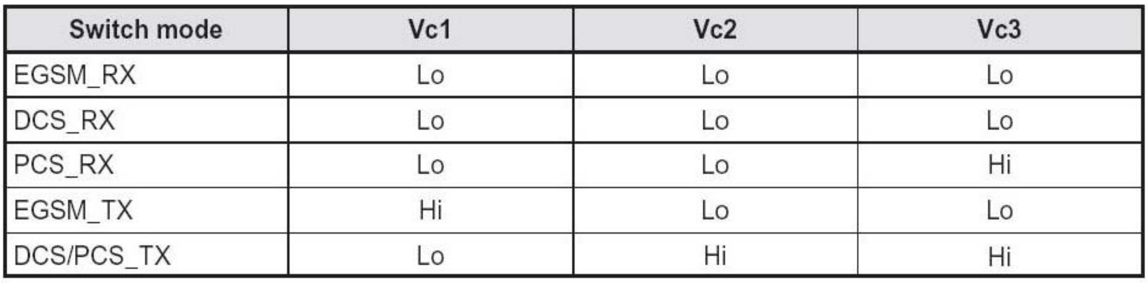
3.1.1.3.2.3 Replace Vinku (N7501)

- N7501 is not serviceable.

3.1.1.3.3 Replace PA (N7502)

3.1.1.4 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations from section “Test point locations”). Notice: these test points are PWB pads for three non-assembled capacitors.



Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.1.1.4.1 Replace Hinku (N7500)

- N7500 is not serviceable.

3.1.1.5 Replace antenna Switch Z7503

3.1.2 Does GSM TX transmit enough RF-power and power levels otherwise ok?

3.1.2.1 Is Vinku ASIC (N7501) transmitting correct RF-power?

- GSM transmitter has to be active before Vinku's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900:

- Connect the RF probe to Z7504 input. The level should be about the same on both input pins. Check output level with at least the maximum (5) and the minimum (19) power levels.

- Maximum power level – Output level should be about -15...-25 dBm

- Minimum power level – Output level should be about -45...-55 dBm

- GSM1800/GSM1900:

- Connect the RF probe to the input of T7502. The level should be about the same on both capacitors. Check output level with at least the maximum (0) and the minimum (15) power levels.

- Maximum power level – Output level should be about -25...-35 dBm

- Minimum power level – Output level should be about -55...-65 dBm

- Check if output levels of Vinku are as expected.
- **NOTE! If VINKU ASIC is transmitting wrong TX power just in one or two GSM-bands, typically this means that Vinku ASIC (N7501) is faulty or the ASIC is badly soldered. Of course SAW-filter Z7504 or balun T7502 can be also faulty/badly soldered and causing short-circuit, but probability to this is quite low. For example: VINKU is transmitting too low power in EGSM900-band but TX-power is ok in other GSM-bands. Then it's almost clear that VINKU (N7501) is faulty or badly soldered. Note that N7501 cannot be replaced.**

3.1.2.1.1 RF operating voltage VBAT_ASIC ok?

- See section "RF operating voltage VBAT_ASIC ok?"

3.1.2.1.2 Is Vinku (N7501) regulator voltage VREG2 ok?

- GSM transmitter has to be active before VREG2 voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with an oscilloscope and a probe.
- VREG2: Connect the probe to C7554, C7555
- VREG2 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

3.1.2.1.2.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.1.2.1.3 Are TX-IQ signal waveforms looking correct?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 ST_CDSP_TX_IQ_TEST these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.1.2.1.4 Is Retu OK?

3.1.2.1.5 Does GSM PA (N7502) get correct DET_SW_G -voltage from Vinku ASIC (N7501)?

- GSM transmitter has to be active before DET_SW_G voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7595 pad. Notice: C7595 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- DET_SW_G voltage should be about 2.8 V while TX burst and 0 V otherwise.

3.1.2.1.5.1 C7595 working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check with an ohmmeter that C7595 is not short-circuited.

3.1.2.1.5.2 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.1.2.1.6 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor.
- Check R7516 resistance value with an ohmmeter and replace resistor if needed.

3.1.2.1.7 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.2.1.7.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.2.1.7.1.1 Replace TX VCO G7502

3.1.2.1.7.2 Replace balun T7503

3.1.2.1.8 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.1.2.2 Does GSM PA (N7502) have enough RF-power in its input?

- GSM transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to the maximum ("5" in EGSM900 and "0" in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- EGSM900: Connect the probe to the output of Z7504. The RF level should be roughly -15...-20 dBm.
- GSM1800 or GSM1900: Connect the probe to R7535. The RF level should be roughly -20...-30 dBm.

3.1.2.2.1 EGSM900: Replace SAW Z7504

3.1.2.2.2 GSM1800/GSM1900: Is Vinku (N7501) output RF-signal coming correctly to the T7502 (Balun)?

- GSM transmitter has to be active before measurements Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to T7502 input. There are two input ports in T7502 because the input port is balanced. The RF level should be roughly -25 dBm in both inputs.

3.1.2.2.2.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.1.2.2.3 GSM1800/GSM1900: Is there correct RF power in the balun (T7502) output?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“0” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- GSM1800 or GSM1900: Connect the probe to R7512 input. The RF level should be roughly -20...-30 dBm.

3.1.2.2.3.1 Replace balun T7502

3.1.2.2.4 GSM1800/GSM1900: Replace attenuator R7535.

3.1.2.3 GSM PA (N7502) transmitting correct RF-power?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the **minimum** (“19” in EGSM900 and “15” in GSM1800/GSM1900)
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and power should be measured during TX burst (triggering

needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.

- EGSM900: Connect the probe to the pin 11 of Z7503. The RF level should be about -16...-17 dBm.
- GSM1800 or GSM1900: Connect the pin 13 of Z7503. The RF level should be roughly -29...-30 dBm in both bands.

3.1.2.3.1 GSM PA (N7502) operating voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7593
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.2.3.1.1 PA operating voltage VBAT_PA ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

3.1.2.3.1.1.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

3.1.2.3.1.2 C7593 ok?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

3.1.2.3.1.3 Replace inductor L7516

- If replacing doesn't help then replace GSM PA (N7502)

3.1.2.3.2 Are bias currents coming correctly to the GSM PA (N7502)? Level ok?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.

- EGSM900:
  - Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
  - Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 “Icont_21/Icont_22 (DC Offset 1.2 V)” when measured with an oscilloscope and a probe. Check both currents.
- GSM1800 or GSM1900:
  - Connect the probe to C7561 or C7556.
  - Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 “Icont_31/Icont_32 (DC Offset 1.2 V)” when measured with an oscilloscope and a probe. Check both currents.

3.1.2.3.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.1.2.3.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing
Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

3.1.2.3.2.3 Replace Vinku (N7501) or GSM PA (N7502)

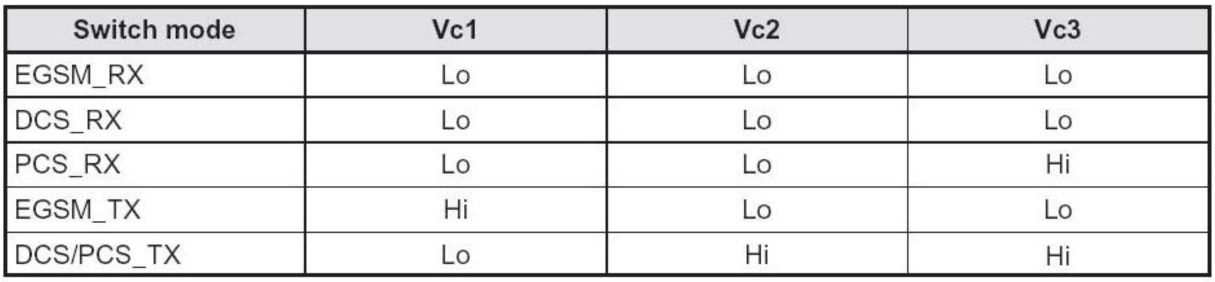
- N7501 is not replaceable.

3.1.2.3.3 Replace GSM PA (N7502)

3.1.2.4 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations, see section “Test point locations). Notice: these test points are PWB pads for three non-

assembled capacitors.



Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.1.2.4.1 Replace Hinku (N7500)

3.1.2.5 Replace antenna Switch Z7503

3.1.3 GSM transmitter frequency correct?

- Connect a spectrum analyser to the module test jig’s RF connector.
- Set GSM Tx ON. Procedure is explained in section “Transmitter troubleshooting”.
- Check if the frequency of the GSM transmitter is as expected. If output signal is not found try to use 500 MHz span setting.

  The correct TX frequency is shown in Phoenix “RF Controls (GSM)” window and can be found also in see section “Frequency mappings”. If the frequency is not found at all then go to 3.1.1 “Does GSM TX transmit RF-power at all?”

3.1.3.1 Is TX VCO frequency as expected?

- GSM transmitter has to be active before TX VCO’s output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. It won’t expose if the T7503 is broken or the output level of the VCO is too low. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.3.1.1 VRCP2-voltage ok?

- GSM transmitter has to be active before VRCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221.
- VRCP2 voltage should be about 4.75 V.

3.1.3.1.1.1 C7550 and C2221 working correctly?

- C7550 is not accessible.
- Check that the accessible component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VRCP2-line is short-circuited to the ground. If short-circuit is found replace C2221. If this does not help go to the next steps.

3.1.3.1.1.2 Retu ok?

3.1.3.1.2 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.1.3.1.3 Balun T7503 ok?

- GSM transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.3.1.4 Components near TX VCO ok?

C7571, R7519, R7523, C7573 and C7568 working correctly?

- Only C7571 can be reached.
- Check that the component is in place and solder joints are ok

- Use an ohmmeter to check if capacitors are short-circuited

3.1.3.1.5 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.1.3.2 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30…-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.1.3.2.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.1.3.2.1.1 Replace TX VCO G7502

3.1.3.2.2 Replace balun T7503

3.1.3.3 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.2 Does the phone give realistic RSSI-values?

Attach the phone to the product specific test jig and a signal generator to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

Use the signal generator to supply -90 dBm RF-level (unmodulated signal) to the phone via the antenna coupler. Set generator RF-level to -90 dBm + cable and coupler attenuation. This measurement should be performed in a RF-shielded environment because existing GSM-network base stations can disturb this measurement otherwise.

- Set RF-generator frequency as following:

- EGSM900: 942.46771 MHz (channel 37)

- GSM1800: 1842.86771 MHz (channel 700)

- GSM1900: 1960.06771 MHz (channel 661)

- Use Phoenix testing & tuning software to perform GSM receiver activation and RSSI measurement for proper channels. Procedure is explained in section “GSM RX chain activation for manual measurements” (Start “Testing” -> “GSM” -> “RSSI Reading” tool in Phoenix. Select the correct band and channel).

- “RSSI Reading” -tool should show quite exact -90 dBm RSSI level. Remember to take into account attenuation between the phone and signal generator. Test also Q and I branches separately. Signal level in both I and Q lines should be about -93 dBm

- Increase signal generator RF level to -60 dBm. Phoenix ”RSSI Reading” tool should show now quite exact RSSI level -60 dBm. Test also Q and I branches separately. Signal level in both I and Q lines should be about -63 dBm

- If RSSI-levels are not as expected separate the phone into parts and place to the module jig. Connect the signal generator to the module jig GSM RF connector (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. Make sure that all connections are made to the correct RF-connector*).

3.2.1 Is Hinku (N7500) ASIC receiving RF-power correctly from the GSM-antenna connector?

- GSM receiver has to be active before measurements. Procedure is explained in section “GSM RX chain activation for manual measurements.”

- Connect an RF-generator to the GSM-antenna connector

- Set RF-generator frequency as following:

- EGSM900: 942.46771 MHz

- GSM1800: 1842.86771 MHz

- GSM1900: 1960.06771 MHz

- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW and VBW = 10 kHz, Span = 0 kHz, sweep time 5 ms.

- RF-signals in this measurement are pulsed and video triggering is needed in the spectrum analyser (software dependent issue. With some phone softwares these signals are constant in “Local” mode and triggering is not needed)

- EGSM900: Connect the probe to C7512 or C7514. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.

- GSM1800: Connect the probe to C7581 or C7584. The RF level should be roughly -85...-90 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- GSM1900: Connect the probe to C7523 or C7525. The RF level should be roughly -85...-90 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both capacitors. Remember to select the correct band also in Phoenix.
- **NOTE! If RSSI-values are correct only in one or two GSM-bands but RX ASIC HINKU (N7500) is receiving RF-power correctly from the GSM antenna connector in all three GSM-bands, typically this means that Hinku ASIC (N7500) is faulty or the ASIC is badly soldered. For example: RSSI-values are not realistic in EGSM900-band but are ok in other bands and HINKU is receiving RF-power correctly in all bands. Then it's quite clear that HINKU (N7500) is faulty. Note that N7500 is not replaceable.**

3.2.1.1 Is Z7503 (antenna switch) working correctly?

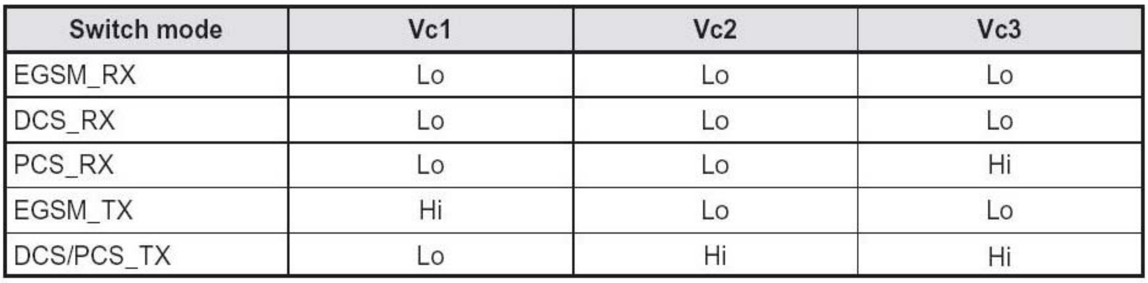
- GSM receiver has to be active before measurements. Procedure is explained in section “GSM RX chain activation for manual measurements”.
- Connect an RF-generator to the GSM-antenna connector
- Set RF-generator frequency as following:

- EGSM900: 942.46771 MHz (Channel 37)
- GSM1800: 1842.86771 MHz (Channel 700)
- GSM1900: 1960.06771 MHz (Channel 661)

- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW and VBW = 10 kHz, Span = 0 kHz, sweep time 5 ms.
- RF-signals in this measurement are pulsed and video triggering is needed in the spectrum analyser (software dependent issue. With some phone softwares these signals are constant in “Local” mode and triggering is not needed).
- EGSM900: Connect the probe to L7504. The RF level should be roughly -75 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.
- GSM1800: Connect the probe to L7505. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.
- GSM1900: Connect the probe to L7506. The RF level should be roughly -85 dBm during RX period when input signal in GSM antenna connector is -50 dBm. RF-levels should be about the same on both ends of the inductor. Remember to select the correct band also in Phoenix.

3.2.1.1.1 Are control voltages VC1, VC2 and VC3 coming correctly to the antenna switch (Z7503)?

- Use “RF Controls” window in Phoenix test software to activate the GSM transmitter and to select the wanted GSM band. Procedure is explained in section “Transmitter troubleshooting”. GSM RX activation is described in section “GSM RX chain activation for manual measurements”.
- Use an oscilloscope and probe to find out if antenna switch control lines are working according to table shown below. “Hi” means that there is 2.4 – 2.8 V control voltage level in the corresponding control line. “Lo” means levels 0 – 0.2 V. Remember to trigger the oscilloscope because control voltages VC1, VC2 and VC3 are pulsed
- Connect the probe to correct test points to measure VC1, VC2 and VC3 voltages (check test point locations, see section “Test point locations”). Notice: these test points are PWB pads for three non-assembled
capacitors.



Switch mode	Vc1	Vc2	Vc3
EGSM_RX	Lo	Lo	Lo
DCS_RX	Lo	Lo	Lo
PCS_RX	Lo	Lo	Hi
EGSM_TX	Hi	Lo	Lo
DCS/PCS_TX	Lo	Hi	Hi

3.2.1.1.1.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.3 GSM Transmitter phase error ok?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. Change TX data type to “Random” in Phoenix.
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Trigger to TX burst midamble should be used.
- Attach the phone to the product specific test jig and the RF-measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- The RMS Phase error shall not be greater than 5° and the peak phase error not greater than 20°.
- If phase error is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. Make sure that all connections are made to the correct RF-connector*).

3.3.1 Are capacitors in Vinku REG1 and REG2 lines in place?

C7554, C7555 and C7547 (GSM1800 and GSM1900: also C7552)

- Only C7554 and C7555 accessible.
- Check that components are in place and solder joints are ok

3.3.2 Are capacitors in GSM PA power supply line in place?

- C7569 and C7583
- Check that component is in place and solder joints are ok

3.3.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.3.4 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.3.4.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.3.4.1.1 Replace TX VCO G7502

3.3.4.2 Replace balun T7503

3.3.5 VCTCXO frequency and output level correct?

- Only frequency can be verified.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C6030.
- The frequency of the VCTCXO should be exactly 38.4 MHz.

3.3.5.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

3.3.5.1.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 accessible.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

3.3.5.1.2 Replace Retu

3.3.5.1.3 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.3.5.2 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield

3.4 GSM (GMSK) modulation spectrum ok?

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Settings have to be done according to the 3GPP specifications. Modulation spectrum measurement is possible to perform also with a spectrum analyser, but in this case measurement settings have to be done manually.
- Attach the phone to the product specific test jig and the RF-test device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

- Set TX Data Type to “Random” in Phoenix
- Enter correct “Centre frequency” to the spectrum analyser (see section “Frequency mappings”) and “Span” should be set to 2 MHz. “RBW” and “VBW” should be set to 30 kHz.
- Select a correct attenuator in the spectrum analyser and set “reference level offset” according attenuation between the phone and the spectrum analyser.

- Enter “Sweep time” at least to 2.5 s.
- Check that the TX power is not over the specification limits in following offsets (tables below). If the measurement is performed with a spectrum analyser according above settings then there may be 1 to 3 dB exceeding with some limit values. This is caused because above settings are meant only for fast modulation spectrum checking and are not exactly done according 3GPP specification.

EGSM900/GSM1800/1900:

Offset (kHz)	100	200	250	400	≥ 600 < 1 800
Limit (dBc)	+0,5	-30	-33	-60	-60

One example of measured GSM Modulation Spectrum in EGSM900 band is presented in figure 6.5.8 "TX Modulation spectrum (GSM)"..

- If modulation spectrum is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. and WLAN.. Make sure that all connections are made to the correct RF-connector*).

3.4.1 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor. Check R7516 resistance value with an ohmmeter and replace resistor if needed.

3.4.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:
- Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
- Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 “Icont_21/Icont_22 (DC Offset 1.2 V)”, when measured with an oscilloscope and a probe. Check both currents.
- GSM1800 or GSM1900:

- Connect the probe to C7561 or C7556.

Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 "Icont_31/Icont_32 (DC Offset 1.2 V)" when measured with an oscilloscope and a probe. Check both currents.

3.4.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.4.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing
Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.4.2.3 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.4.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

3.4.4 Is TX VCO signal level in the T7503 output high enough?

- GSM transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines during GSM TX burst. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

3.4.4.1 TX VCO G7502 output level high enough?

- GSM transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW and VBW = 1 MHz, Span = 0, sweep time 1 ms. Notice that GSM transmission has pulsed nature and VCO output power should be measured during TX burst (triggering needed). Another possibility is to use following settings: RBW = VBW = 1 MHz, Span 200 kHz and sweep time at least 2.5 seconds.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm during GSM TX burst.

3.4.4.1.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.4.5 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.5 TX power vs. time ok?

This section means situation when GSM TX power levels are ok, but burst timing is not correct or power changes during TX burst.

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”. ***Note!*** *It is probably needed to change the Tx Data Type in Phoenix to “Random” before this measurement can be performed.*
- Measurement can be done with a GSM transmitter tester or other GSM communication tester. Attach the phone to the product specific test jig and the measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- If TX power vs. time is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. Make sure that all connections are made to the correct RF-connector*).

3.5.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.5.2 Does GSM PA (N7502) get correct bias currents? Is the level of bias currents ok?

EGSM: Icont_21 and Icont_22
GSM1800/GSM1900: Icont_31 and Icont_32

- GSM transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to the maximum (“5” in EGSM900 and “0” in GSM1800/GSM1900)
- Measurements can be done with an oscilloscope and a VOLTAGE probe.
- EGSM900:

- Connect the probe to C7545 or C7544. Notice: C7544 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB
- Typical full TX power bias currents (Icont_21 and Icont_22) should look somehow similar to figure 6.5.4 "Icont_21/Icont_22 (DC Offset 1.2 V)" when measured with an oscilloscope and a probe. Check both currents.

- GSM1800 or GSM1900:

- Connect the probe to C7561 or C7556.

- Typical full TX power bias currents (Icont_31 and Icont_32) should look somehow similar to figure 6.5.5 "Icont_31/Icont_32 (DC Offset 1.2 V)" when measured with an oscilloscope and a probe. Check both currents.

3.5.2.1 Vinku (N7501) RB_EXT voltage ok?

- See section "Vinku (N7501) RB_EXT voltage ok?"

3.5.2.2 Are capacitors in GSM PA (N7502) bias lines working correctly?

EGSM: Icont_21 missing
Icont_22 missing – C7545 short-circuited?
GSM1800/GSM1900: Icont_31 missing – C7556 short-circuited?
Icont_32 missing – C7561 short-circuited?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

3.5.2.3 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.5.3 Does GSM PA (N7502) get correct DET_SW_G -voltage from Vinku ASIC (N7501)?

- GSM transmitter has to be active before DET_SW_G voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7595. Notice: C7595 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- DET_SW_G voltage should be about 2.8 V while TX burst and 0 V otherwise.

3.5.3.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

3.5.4 Are components in GSM power control loop in place and working ok?

R7516 and C7559

- Disconnect the power supply from the phone and use an ohmmeter to check that C7559 is not short-circuited. If short-circuit is found replace the capacitor.

- Check R7516 resistance value with an ohmmeter and replace resistor if needed.

4. DOES THE PHONE REGISTER TO THE CALLBOX AND MAKE A CALL (WCDMA)?

- Test against a WCDMA communication tester.

4.1 WCDMA TX power and transmit frequency ok?

- Attach the phone to the product specific test jig and a spectrum analyser to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Set WCDMA TX ON. Procedure is explained in section “Transmitter troubleshooting”.
- Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms.
- Test at power level 21 dBm

- The output power should be +17 – +23 dBm, typical value 21 dBm.

- Remember to select “Stop RF” in Phoenix before opening the shield box hatch.
- If power is not as expected separate the phone into parts and place to the module jig. Connect a spectrum analyser to the module jig WCDMA RF connector and measure TX power again (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. Make sure that all connections are made to the correct RF-connector*).

- TX power ok in the module jig: Antenna or antenna connection bad. Replace the antenna
- TX power still wrong or no TX signal found at all: Continue troubleshooting

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency, see section, 4.1.3."WCDMA transmitter frequency correct?".

4.1.1 Does the WCDMA TX transmit RF-power at all?

- If TX signal is not found at all use wider span setting and check if the transmitter is transmitting on wrong frequency. If signal is found to be on wrong frequency, see section 4.1.3. "WCDMA transmitter frequency correct?".

4.1.1.1.1 Vinku (N7501) regulator voltage VREG2 ok?

- WCDMA transmitter has to be active before VREG2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with an oscilloscope and a probe.

- VREG2: Connect the probe to C7554, C7555
- VREG2 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.1.1.1.1.1.1 VREF-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R2200, the side opposite to C2202.
- VREF voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.1.1.1.2 Are capacitors in Vinku (N7501) regulator lines working correctly?

VREG2: C7547, C7548, C7554, C7555, C7553, C7552, C7558 and C7567

- Only C7554, C7555 accessible.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that regulator lines are not short-circuited to the ground. If short-circuit is found replace capacitors mentioned above. If this does not help go to the next step.

4.1.1.1.1.3 TX VCO (G7502) ok?

4.1.1.1.1.4 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

4.1.1.1.1.4.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 is accessible.
- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

4.1.1.1.1.4.2 Replace Retu

4.1.1.1.2 VRCP2-voltage ok?

- WCDMA transmitter has to be active before VRCP2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221.

- VRCP2 voltage should be about 4.75 V.

4.1.1.1.2.1 Retu ok?

4.1.1.1.3 Is there RF power in the TX VCO output at all?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The correct VCO frequency can be found in see section "Frequency mappings". The output level of the VCO should be about -25 dBm.

4.1.1.1.3.1 TX VCO operating voltage VREG2 (VR2) ok?

- See section 4.1.1.1.3 "Vinku (N7501) regulator voltages VREG1, VREG2 ok?"

4.1.1.1.3.2 Replace TX VCO (G7502)

4.1.1.1.4 Is TX VCO RF-signal coming to the Vinku at all?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.1.1.4.1 Replace balun T7503

4.1.1.1.5 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3. "ST_CDSP_TX_IQ_TEST" these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.1.1.1.6 Retu ok?

4.1.1.1.7 VCTCXO frequency and output level ok?

- Only frequency can be verified.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C6030.
- The frequency of the VCTCXO should be exactly 38.4 MHz.

4.1.1.1.7.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

4.1.1.1.7.1.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 accessible.
- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

4.1.1.1.7.1.2 Replace Retu

4.1.1.1.7.1.3 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.1.1.2 Is WCDMA PA (N7503) transmitting RF-power at all?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms
- Connect the probe to Z7505 input. The RF level should be roughly -16…-28 dBm.

4.1.1.2.1 Does WCDMA PA (N7503) get operating voltage Vcc12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R7525
- Vcc12 voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.2.1.1 R7525 in place and working correctly?

- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check R7525 resistance value with an ohmmeter

4.1.1.2.1.2 PA operating voltage VBAT_PA ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.2.1.2.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

4.1.1.2.2 Does WCDMA PA (N7503) get operating voltage Vcc11?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to -40 dBm (Set start level to "-40.0" in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm). NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.1.2.2.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found

replace capacitors mentioned above.

4.1.1.2.2.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.1.2.2.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.1.2.2.3.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.1.1.2.2.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.1.2.2.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.1.2.2.4.1.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.1.1.2.2.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter also to check that L7514 is conducting DC.

4.1.1.2.2.5 Replace SMPS N7504

4.1.1.2.3 Does WCDMA PA (N7503) get bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7579
- WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
- Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.1.1.2.3.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.1.1.2.3.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 missing – C7579 short-circuited?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor. If this does not help go to the next step.

4.1.1.2.4 Replace PA (N7503)

4.1.1.3 Does duplex-filter (Z7502) get correct RF-power level from WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct

frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”).

- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms
- Connect the probe to Z7502 TX input. The RF level should be roughly -20...-30 dBm.

4.1.1.3.1 Replace isolator Z7505

4.1.1.4 Replace duplex-filter Z7502

4.1.2 Does WCDMA TX transmit enough RF-power and power levels otherwise ok?

4.1.2.1.1 Vinku (N7501) regulator voltage VREG2 ok?

- WCDMA transmitter has to be active before VREG2 voltage can be measured. Procedure is explained in section “Transmitter troubleshooting”. Measurements can be done with an oscilloscope and a probe.
- VREG2: Connect the probe to C7551, C7555
- VREG2 voltage level should be 2.65 – 2.86 V. Typical value is 2.7 V.

4.1.2.1.1.1 VREF-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R2200, the side opposite to C2202.
- VREF voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.1.1.1.1 Retu ok?

4.1.2.1.2 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 “ST_CDSP_TX_IQ_TEST” these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

4.1.2.1.2.1 Retu ok?

4.1.2.1.3 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO’s output level can be measured. Procedure is explained in section “Transmitter troubleshooting”.
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to

solder the shield back after the phone repairing.

4.1.2.1.3.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.

- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.2.1.3.1.1 Replace TX VCO G7502

4.1.2.2 Does WCDMA PA (N7503) transmit correct RF-power?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".

- Set TX power level to 0 dBm (Set start level "0" to Phoenix)

- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings").

- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms.

- Connect the probe to Z7505 input. The RF level should be roughly -16...-28 dBm.

4.1.2.2.1 Does WCDMA PA (N7503) get correct operating voltage Vcc12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R7525

- Vcc12 voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.2.1.1 R7525 in place and working correctly?

- Check that the component is in place and solder joints are ok

- Disconnect the power supply from the phone and check R7525 resistance value with an ohmmeter

4.1.2.2.1.2 PA operating voltage VBAT_PA ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section

"Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- Voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.2.1.2.1 Ferrite Z7500 ok?

- Check that component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that inductor is conducting DC.

4.1.2.2.2 Does WCDMA PA (N7503) get correct operating voltage Vcc11?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to -40 dBm (Set start level to "-40.0" in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm). NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.2.2.2.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.1.2.2.2.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.1.2.2.2.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.2.2.2.3.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.1.2.2.2.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.1.2.2.2.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.1.2.2.2.4.1.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.1.2.2.2.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter to check that L7514 is conducting DC.
- Use a diode meter to make sure that diodes inside V7500 are working correctly.

4.1.2.2.2.5 Replace SMPS N7504

4.1.2.2.3 Does WCDMA PA (N7503) get bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.

- Set TX power level to -40 dBm (Set start level to “-40.0” in phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7579
- WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
- Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe should be connected to the pad that can be still found from the PWB.
- WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.1.2.2.3.1 VREF-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R2200, the side opposite to C2202.
- VREF voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.2.2.3.1.1 Retu ok?

4.1.2.2.3.2 Is capacitor C7579 in WCDMA PA (N7503) bias line working correctly?

Icont_12 – C7579 short-circuited?

- Check that the capacitor is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that the capacitor is not short-circuited. If short-circuit is found replace the capacitor.

4.1.2.2.3.3 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.1.2.2.4 Replace PA (N7503)

4.1.2.3 Does duplex-filter (Z7502) get correct RF-power from WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to 0 dBm (Set start level “0” to Phoenix)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency setting to the spectrum analyser. Spectrum analyser centre frequency should be set according the used TX channel (see section “Frequency mappings”)
- Spectrum analyser RBW = VBW = 10 MHz, Span ≤ 2 MHz, sweep time 100 ms
- Connect the probe to Z7502 TX input. The RF level should be roughly -20...-30 dBm.

4.1.2.3.1 Replace isolator Z7505

4.1.2.4 Replace duplex-filter Z502

4.1.3 WCDMA transmitter frequency correct?

- Connect a spectrum analyser to the module test jig RF connector.
- Set WCDMA Tx ON. Procedure is explained in section "Transmitter troubleshooting".
- Check if the frequency of the transmitter is as expected. If output signal is not found try to use 500 MHz span setting.

  The correct TX frequency is shown in Phoenix "Tx Control (WCDMA)" window and can be found also in see section "Frequency mappings". If the frequency is not found at all then go to 4.1.1"Does the WCDMA TX transmit RF-power at all?"

4.1.3.1 Is TX VCO frequency as expected?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing. *Quick VCO alive check can be done without removing the RF shield. The RF probe should be placed as near the TX VCO output as possible (Put the head of the probe carefully inside the VCO can through the holes of the shield). This method can be used only to check that the TX VCO is alive. It won't expose if the T7503 is broken or the output level of the VCO is too low. Remember to use low RF Attenuator value in the spectrum analyser with this method.*
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.3.1.1 VRCP2-voltage ok?

- WCDMA transmitter has to be active before VRCP2 voltage can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2221.
- VRCP2 voltage should be about 4.75 V.

4.1.3.1.1.1 Retu ok?

4.1.3.1.1.2 Vinku (N7501) ok?

4.1.3.1.2 VREF-voltage ok?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to R2200, the side opposite to C2202.
- VREF voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.1.3.1.2.1 Retu ok?

4.1.3.1.2.2 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield

4.1.3.1.3 Balun T7503 ok?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the TX VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.1.3.1.4 Are components near the TX VCO ok?

C7571, R7519, R7523, C7573 and C7568 working correctly?

- Only C7571 accessible.
- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter.
- Use an ohmmeter to check also that capacitors are not short-circuited

4.1.3.1.5 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield

4.1.3.1.6 Replace TX VCO G7502

4.1.3.2 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to

solder the shield back after the phone repairing.

4.1.3.2.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".
- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.
- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.
- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.1.3.2.1.1 Replace TX VCO G7502

4.1.3.2.2 Replace balun T7503

4.1.3.3 VCTCXO frequency and output level ok?

- Only frequency can be verified.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C6030.
- The frequency of the VCTCXO should be exactly 38.4 MHz.

4.1.3.3.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

4.1.3.3.1.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 accessible.
- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

4.1.3.3.1.2 Replace Retu

4.1.3.3.1.3 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.2 Does the phone give realistic RSSI-values?

Attach the phone to the product specific test jig and a signal generator to the RF-coupler. Coupler attenuation should be also taken into account during measurements.

Use the signal generator to supply -90 dBm RF-level to the phone via the antenna coupler. Set generator RF-level to -90 dBm + Cable and coupler attenuation. This measurement should be performed in a RF-shielded environment because existing WCDMA-network base stations can disturb this measurement otherwise.

- Set RF-generator frequency to 2141.0 MHz (unmodulated signal).
- Use Phoenix testing & tuning software to perform WCDMA receiver activation and RSSI measurement for channel 10700. Procedure is explained in sections “WCDMA RX chain activation for manual measurement” and “WCDMA RSSI measurement”.
- “Rx Power Measurement” tool should show quite exact -90 dBm RSSI level. Remember to take into account attenuation between the phone and signal generator.
- Increase signal generator RF level to -60 dBm. Phoenix ”Rx Power Measurement” tool should show now quite exact RSSI level -60 dBm.
- If RSSI-levels are not as expected separate the phone into parts and place to the module jig. Connect the signal generator to the module jig WCDMA RF connector (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. and WLAN.. Make sure that all connections are made to the correct RF-connector*).

4.2.1 Does duplex-filter (Z7502) work properly?

- WCDMA receiver has to be active before measurements. Procedure is explained in section “Receiver troubleshooting”.
- Connect an RF-generator to the WCDMA-antenna connector
- Set RF-generator frequency to 2141.0 MHz (unmodulated signal)
- Measurements can be done with a spectrum analyser and an RF probe. Remember to make correct frequency settings to the spectrum analyser (Centre frequency should be set to the same frequency as the RF-generator). RBW = VBW = 10 kHz, Span = 0, sweep time = 100 ms.
- Connect the probe to the Rx port of the duplexer (Z7502). The RF level should be roughly -80...-85 dBm in the input pad when input signal level in WCDMA antenna connector is -50 dBm.

4.2.1.1 Replace filter Z7502

4.2.2 VREF-voltage ok?

- Measurement can be done with an oscilloscope and a probe.

- Connect the probe to R2200, the side opposite to C2202.
- VREF voltage should be 1.325 – 1.375 V. Typical value is 1.35 V.

4.2.2.1 Retu ok?

4.2.3 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

4.2.3.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 accessible.
- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

4.2.3.2 Replace Retu

4.2.4 VRCP1-voltage ok?

- WCDMA receiver has to be active before VRCP1 voltage can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7507.
- VRCP1 voltage should be about 4.75 V.

4.2.4.1 C7507 and C2222 ok?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that capacitors C7507 and C2222 are not short-circuited. If short-circuit is found replace faulty capacitor. If this does not help go to the next steps.

4.2.4.2 Retu ok?

4.2.4.3 RX VCO operating voltage VR1 RX ok?

- WCDMA receiver has to be active before Hinku’s VR1RX voltage can be measured. Procedure is explained in section "Receiver troubleshooting"
- Measurements can be done with an oscilloscope and a probe.

- Connect the probe to C2214.
- VR1RX voltage level should be continuous 2.65 - 2.86 V in WCDMA mode. Typical value is 2.7 V.

4.2.4.4 VRCP1-voltage ok?

- WCDMA receiver has to be active before VRCP1 voltage can be measured. Procedure is explained in section “Receiver troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C2222.
- VRCP1 voltage should be about 4.75 V.

4.2.4.4.1 C7507 and C2222 working properly?

- Only C2222 accessible.
- Check that the components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check if C2222 is short-circuited.

4.2.4.4.2 Retu ok?

4.2.4.5 VCTCXO frequency and output level correct?

- Only frequency can be verified.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C6030.
- The frequency of the VCTCXO should be exactly 38.4 MHz.

4.2.4.5.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

4.2.4.5.1.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 accessible.
- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

4.2.4.5.1.2 Replace Retu

4.2.4.5.2 Replace Retu

4.2.5 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.3 WCDMA modulation spectrum and ACLR ok?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with a WCDMA transmitter tester or other WCDMA communication tester. Settings have to be done according to the 3GPP specifications. Modulation spectrum and ACLR measurements are possible to perform also with a spectrum analyser, but in this case measurement settings have to be done manually according to the 3GPP specifications.
- Attach the phone to the product specific test jig and a spectrum analyser or other RF-measurement device to the RF-coupler. Coupler attenuation should be also taken into account during measurements.
- If modulation spectrum is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. and WLAN.. Make sure that all connections are made to the correct RF-connector*).

4.3.1 Does N7504 give correct voltage level (Vcc11) to the WCDMA PA (N7503)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Set TX power level to -40 dBm (Set start level to “-40.0” in Phoenix)
- Measurements can be done with an oscilloscope and a probe.
- Connect the probe to C7580.
- Vcc11 voltage level should be about 1.5 V. The same voltage level should be measured also with all power levels smaller than about 10 dBm. Vcc11 is about 3.3 V with the highest power (21 dBm). NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.3.1.1 L7515, C7589 and C7580 in place and working correctly?

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to check that L7515 is conducting DC.
- Use an ohmmeter also to check that capacitors are not short-circuited. If short-circuit is found replace capacitors mentioned above.

4.3.1.2 Does SMPS N7504 get operating voltage Vdd (=VBAT_PA)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7569 (or C7564, C7583)
- VBAT_PA voltage level should be 3.05 – 5.4 V. Typical value is 4.0 V.

4.3.1.3 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section “Transmitter troubleshooting”.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.3.1.3.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.3.1.4 Does SMPS get correct control voltage from the WCDMA power detector (signal Vcontrol)?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section

"Transmitter troubleshooting".

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7591.
- Vcontrol signal should be constant DC-voltage. Voltage level should change if TX power is changed. Vcontrol is lower on lower power levels and higher if higher power levels are used.
- Vcontrol should be about 570 mV with power level +10 dBm, about 2.0 V with power level +21 dBm and about 200 mV when power levels below 0 dBm are used. NOTE: Perform WCDMA transmitter tests with > 0 dBm power only in RF shielded environment.

4.3.1.4.1 Is there correct DET_SW_W –voltage coming from Vinku ASIC (N7501)?

- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C7586.
- Voltage level should be about 2.78 V.

4.3.1.4.1.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield.

4.3.1.4.2 Check WCDMA power detector components – In place and value correct?

Components L7514, C7585, V7500, R7526, C7586, R7527, C7587, C7590, R7529, R7530, C7591, R7531 and C7592.

- Check that components are in place and solder joints are ok
- Disconnect the power supply from the phone and check resistors resistance values with an ohmmeter
- Use an ohmmeter also to check that L7514 is conducting DC.

4.3.1.5 Replace SMPS N7504

4.3.2 Does WCDMA PA (N7503) get correct bias currents Icont11 and Icont12?

- WCDMA transmitter has to be active before measurements. Procedure is explained in section "Transmitter troubleshooting".
- Set TX power level to -40 dBm (Set start level to "-40.0" in phoenix)
- Measurements can be done with an oscilloscope and a probe.

- Connect the probe to C7579
- WCDMA PA bias current Icont_12 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.
- Connect the probe to C7576 pad. Notice: C7576 is a non-assembled component so the probe

should be connected to the pad that can be still found from the PWB.

- WCDMA PA bias current Icont_11 should look as a constant 2.5 - 2.6 V DC-voltage with all power levels.

4.3.2.1 This board not reworkable because of a fault found under the Hinku/Vinku soldered down shield

4.3.3 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in 2.3 "ST_CDSP_TX_IQ_TEST " these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC or Vinku.

4.3.4 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.

- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

4.3.4.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.

- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

4.3.4.1.1 Replace TX VCO G7502

4.3.4.2 Replace balun T7503

5. DOES THE PHONE HAVE A RELIABLE CONNECTION TO THE NETWORK (GSM)?

This section refers to a situation when the phone registers to the GSM-network and is capable to make a call, but the call is not reliable even if the GSM-network field strength is strong. The phone call is maybe disconnected or interrupted.

5.1 GSM receiver Bit Error Rate (BER) ok?

- This test needs a GSM communication tester and if there is no that kind of tester available continue troubleshooting in section 3.2 “Does the phone give realistic RSSI-values?”.
- Attach the phone to the product specific test jig and a GSM communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a GSM call against the tester
- Settings to the tester have to be done according to the 3GPP specifications:

- Set base station downlink power to -102 dBm

- Bit Error Rate should be less than 2 %

5.1.1 Does the phone give realistic RSSI-values?

- See section 3.2. “Does the phone give realistic RSSI-values?”

5.1.2 Hinku (N7500) or RAP3G (D2800) faulty?

- RAP3G and N7500 are not replaceable.

5.2 GSM transmitter power levels and transmit frequency ok?

- See section 3.1. “GSM transmitter power levels and transmit frequency ok?”

5.3 GSM Transmitter phase error ok?

- See section 3.3. “GSM Transmitter phase error ok?”

5.4 GSM (GMSK) modulation spectrum ok?

- See section 3.4. “GSM (GMSK) modulation spectrum ok?”

5.5 TX power vs. time ok?

- See section 3.5. “TX power vs. time ok?”

6. DOES THE PHONE HAVE A RELIABLE CONNECTION TO THE NETWORK (WCDMA)?

This section means situation when the phone registers to the WCDMA-network and is capable to make a call, but the call is not reliable even if WCDMA-network field strength is strong. The phone call is maybe disconnected or interrupted.

6.1 WCDMA receiver Bit Error Rate (BER) ok?

- This test needs a WCDMA communication tester and if there is no that kind of tester available continue troubleshooting in section 4.2 “Does the phone give realistic RSSI-values?”.
- Attach the phone to the product specific test jig and a GSM communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a GSM call against the tester
- Settings to the tester have to be done according to the 3GPP specifications:

- Set base station output level (Îor) to -106.7 dBm / 3.84 MHz
- Set DPCH_Ec level to -117 dBm / 3.84 MHz

- Bit Error Rate should be less than 0.1 %

6.1.1 Does the phone give realistic RSSI-values?

- See section 4.2 “Does the phone give realistic RSSI-values?”

6.1.2 Hinku (N7500) or RAP3G (D2800) faulty?

- RAP3G and N7500 are not replaceable.

6.2 WCDMA TX power and transmit frequency ok?

- See section 4.1. “WCDMA TX power and transmit frequency ok?”

6.3 WCDMA Transmitter error vector magnitude ok?

- This test needs a WCDMA communication tester and if there is no that kind of tester available continue troubleshooting in section 4.3 “WCDMA modulation spectrum and ACLR ok?”
- Attach the phone to the product specific test jig and the WCDMA communication tester to the RF-coupler. Coupler attenuation should be also taken into account during measurements. This measurement should be done in an RF shielded box.
- Close the shield box hatch.
- Make a WCDMA call against the tester
- The Error Vector Magnitude shall not exceed 17.5 % with power levels ≥ –20 dBm.

- If Error Vector Magnitude is not as expected separate the phone into parts and place to the module jig (*Notice that there are three antenna connectors in the module jig, one for GSM, one for WCDMA and one for Bluetooth and WLAN. and WLAN.. Make sure that all connections are made to the correct RF-connector*).

6.3.1 Is capacitor C7579 in WCDMA PA (N7503) bias line in place?

- Check that the component is in place and solder joints are ok

6.3.2 Are capacitors in Vinku REG1 and REG2 lines in place?

C7554, C7555 and C7547

- C7547 is not accessible.

- Check that components are in place and solder joints are ok

6.3.3 Are capacitors in WCDMA PA power supply lines in place?

C7569 and C7583

- Check that components are in place and solder joints are ok

6.3.4 Are TX-IQ signals ok?

- These current mode signals are not possible to measure, but are tested with self-tests. So if there is no fail in section 2.3. "ST_CDSP_TX_IQ_TEST " these signals should be ok. Otherwise Vinku (N7501) or RAP3G (D2800) is faulty. Notice that it is not possible to replace RAP3G ASIC.

6.3.5 Is TX VCO signal level in the T7503 output high enough?

- WCDMA transmitter has to be active before TX VCO's output level can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.

- Check the level of the VCO frequency in T7503 outputs. The level should be about -30...-35 dBm in both output lines. If the signal level is correct in the input (about -25 dBm) but output level is not as expected then replace T7503. VCO shield has to be removed before measurement. Remember to solder the shield back after the phone repairing.

6.3.5.1 TX VCO G7502 output level high enough?

- WCDMA transmitter has to be active before TX VCO's output frequency and output level can be measured. Procedure is explained in section "Transmitter troubleshooting".

- Measurements can be done with a spectrum analyser and an RF probe. Spectrum analyser centre frequency should be set according the used TX channel (see section "Frequency mappings"). RBW and VBW = 1 MHz, Span ≤ 200 kHz.

- Connect the RF probe to the T7503 input. VCO shield has to be removed before measurement.

Remember to solder the shield back after the phone repairing.

- Check if the frequency of the TX VCO is as expected. If the VCO signal is not found try to use wider span setting. The output level of the VCO should be about -25 dBm.

6.3.5.1.1 Replace TX VCO G7502

6.3.5.2 Replace balun T7503

6.3.6 VCTCXO frequency and output level correct?

- Only frequency can be verified.
- Measurement can be done with an oscilloscope and a probe.
- Connect the probe to C6030.
- The frequency of the VCTCXO should be quite exactly 38.4 MHz.

6.3.6.1 VXO-voltage ok? (=Vdig).

- Measurement can be done with an oscilloscope and a probe
- Connect the probe to C2214.
- VXO-voltage should be about 2.5 V

6.3.6.1.1 C7560, C7513, C7526 and C2214 ok?

- Only C2214 is accessible.
- Check that the component is in place and solder joints are ok
- Disconnect the power supply from the phone and use an ohmmeter to find out if the VXO-line is short-circuited to the ground. If short-circuit is found replace C2214. If replacing does not help then go to the next steps.

6.3.6.1.2 Replace Retu

6.3.6.1.3 Replace Hinku (N7500) or Vinku (N7501) or VCTCXO (G7501) or all three components

- The components not replaceable.

6.3.6.2 BB AFC-voltage ok?

- See section "BB AFC-voltage ok?"

6.3.6.3 Replace VCTCXO G7501

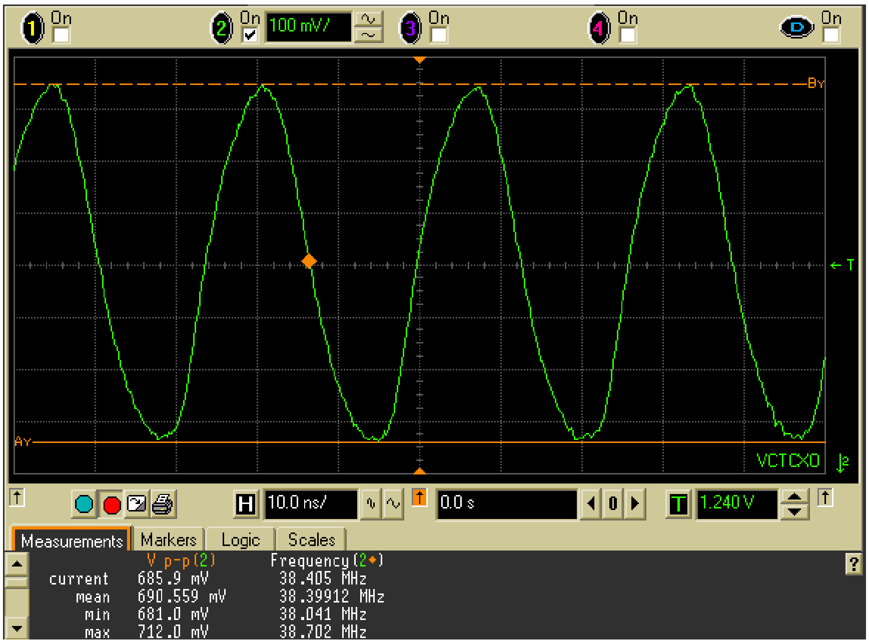
- The components not replaceable.

6.4 WCDMA modulation spectrum and ACLR ok?

- See section 4.3 “WCDMA modulation spectrum and ACLR ok?”

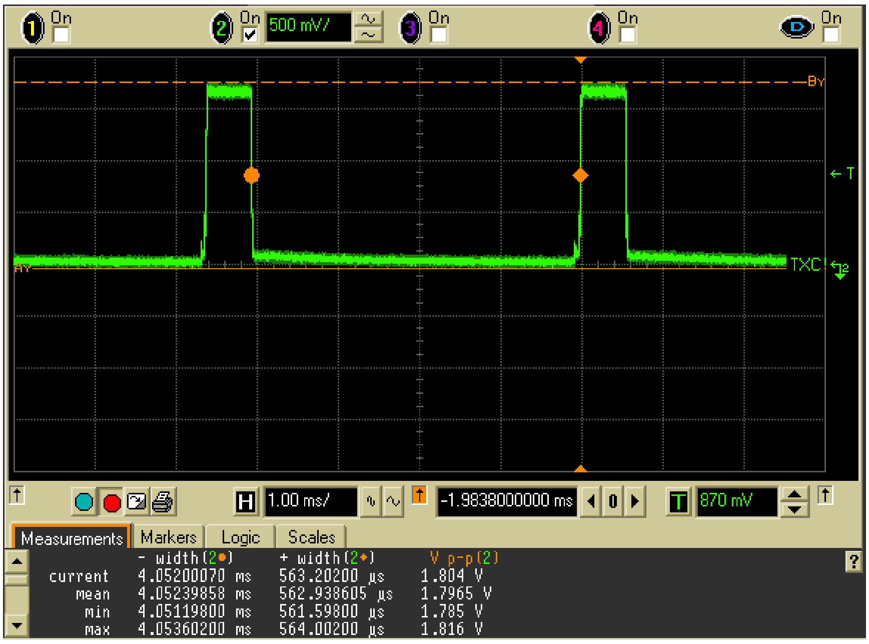
6.5 Troubleshooting pictures

6.5.1 VCTCXO Output (DC Offset 1.24 V)


On
On
100 mV/
On
On
On
BY
T
AY
VCTCXO
10.0 ns/
0.0 s
1.240 V
Measurements
Markers
Logic
Scales

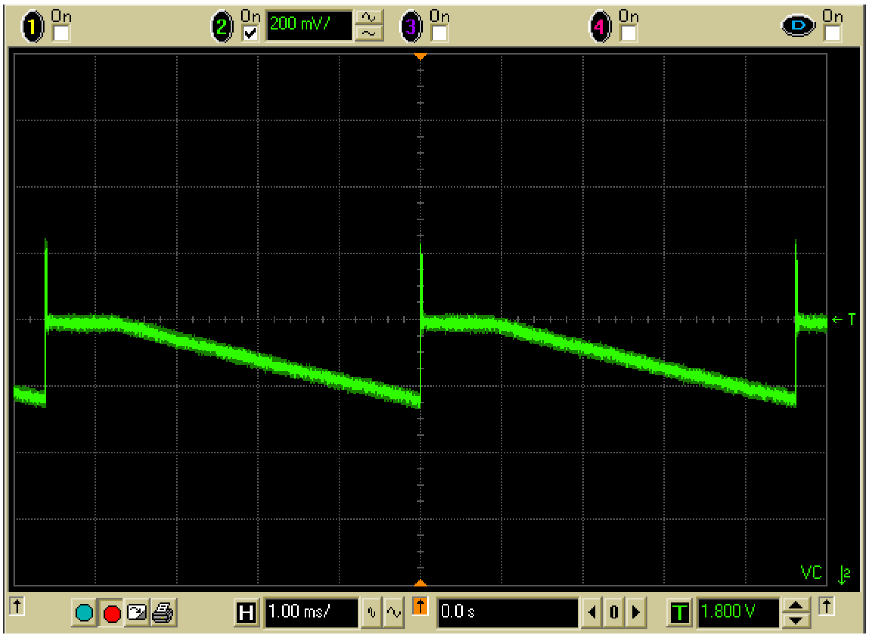
```
             V p-p(2)       Frequency(2•)
  current   685.9 mV         38.405 MHz
     mean   690.559 mV       38.39912 MHz
      min   681.0 mV         38.041 MHz
      max   712.0 mV         38.702 MHz
```

6.5.2 TXC in GSM mode (DC Offset 0 V)


On
On
500 mV/
On
On
On
BY
T
AY
TXC
1.00 ms/
-1.9838000000 ms
870 mV
Measurements
Markers
Logic
Scales

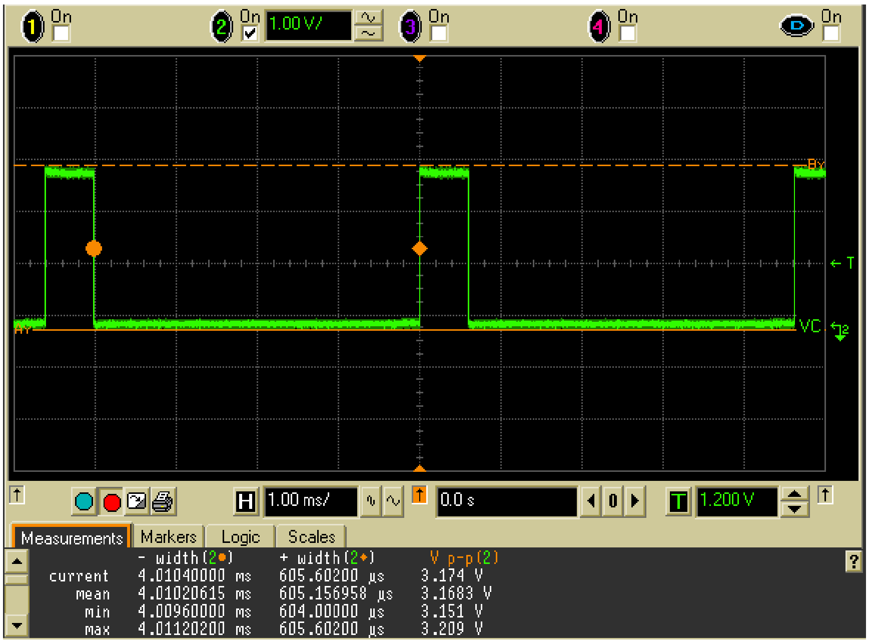
```
             - width(2•)       + width(2•)        V p-p(2)
  current   4.05200070 ms     563.20200 µs       1.804 V
     mean   4.05239858 ms     562.938605 µs      1.7965 V
      min   4.05119800 ms     561.59800 µs       1.785 V
      max   4.05360200 ms     564.00200 µs       1.816 V
```

6.5.3 TX VC in GSM mode (DC Offset 1.8 V)


On
200 mV/
VC
T
1.00 ms/
0.0 s
1.800 V

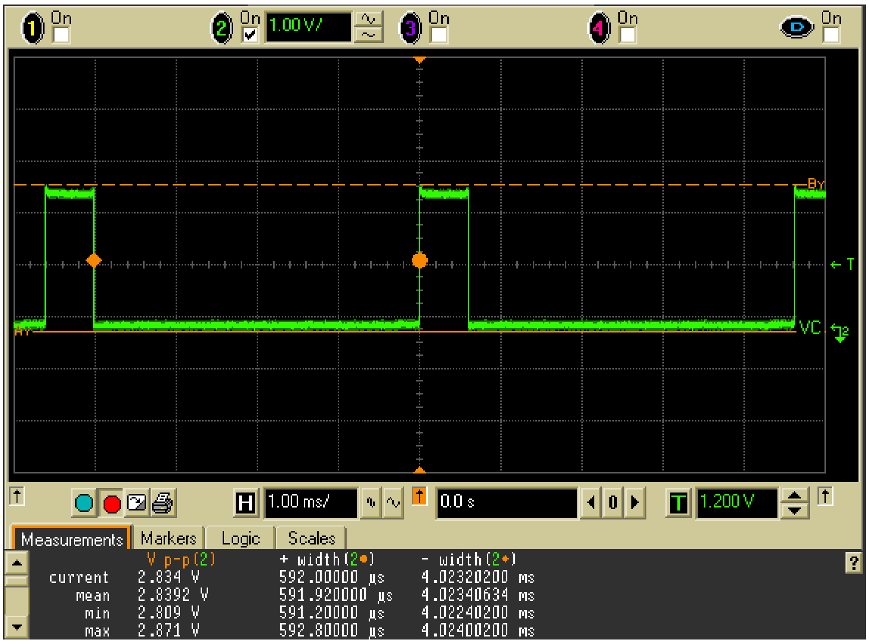
DC value changes if channel or band is changed. Upper figure has been taken in EGSM900 band and on channel 37.

6.5.4 Icont_21/Icont_22 (DC Offset 1.2 V)


On
1.00 V/
VC
T
BY
AY
1.00 ms/
0.0 s
1.200 V
Measurements
Markers
Logic
Scales

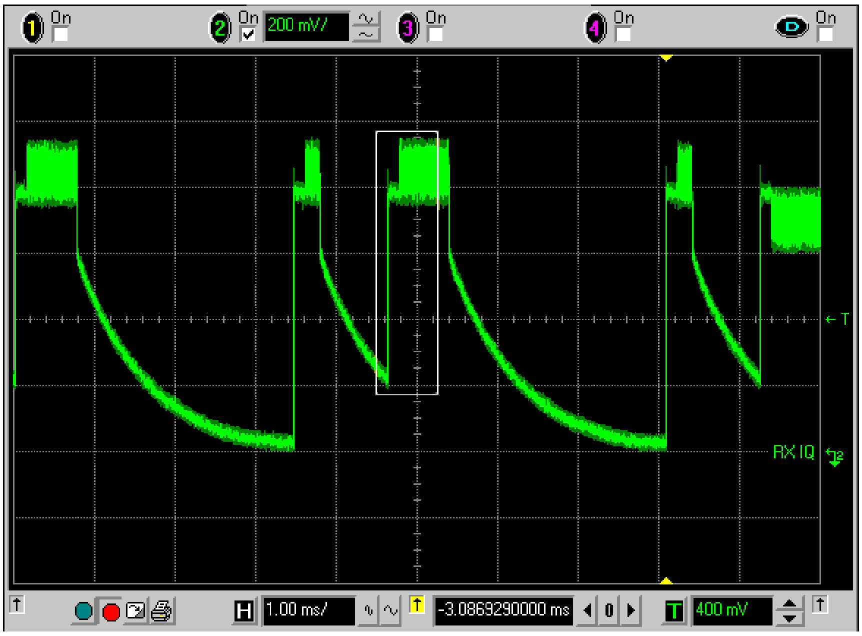
```
           - width(2●)     + width(2◆)     V p-p(2)
current    4.01040000 ms   605.60200 µs    3.174 V
   mean    4.01020615 ms   605.156958 µs   3.1683 V
    min    4.00960000 ms   604.00000 µs    3.151 V
    max    4.01120200 ms   605.60200 µs    3.209 V
```

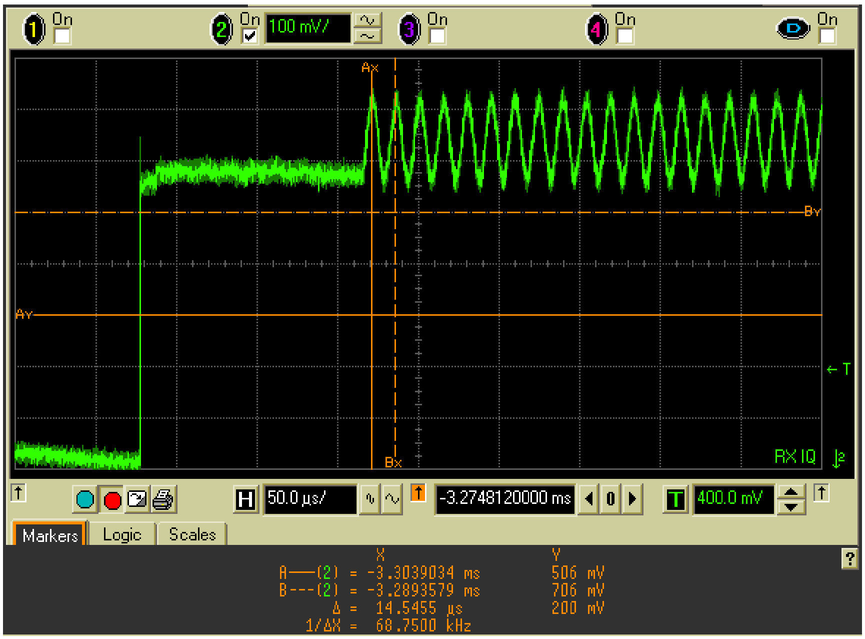
6.5.5 Icont_31/Icont_32 (DC Offset 1.2 V)


On
On
1.00 V/
On
On
On
BY
T
VC
AY
1.00 ms/
0.0 s
0
1.200 V
Measurements
Markers
Logic
Scales
?

```
              V p-p(2)        + width(2●)       - width(2◆)
current    2.834 V         592.00000 µs      4.02320200 ms
   mean    2.8392 V        591.920000 µs     4.02340634 ms
    min    2.809 V         591.20000 µs      4.02240200 ms
    max    2.871 V         592.80000 µs      4.02400200 ms
```

6.5.6 GSM RX IQ (DC Offset 0.4 V)

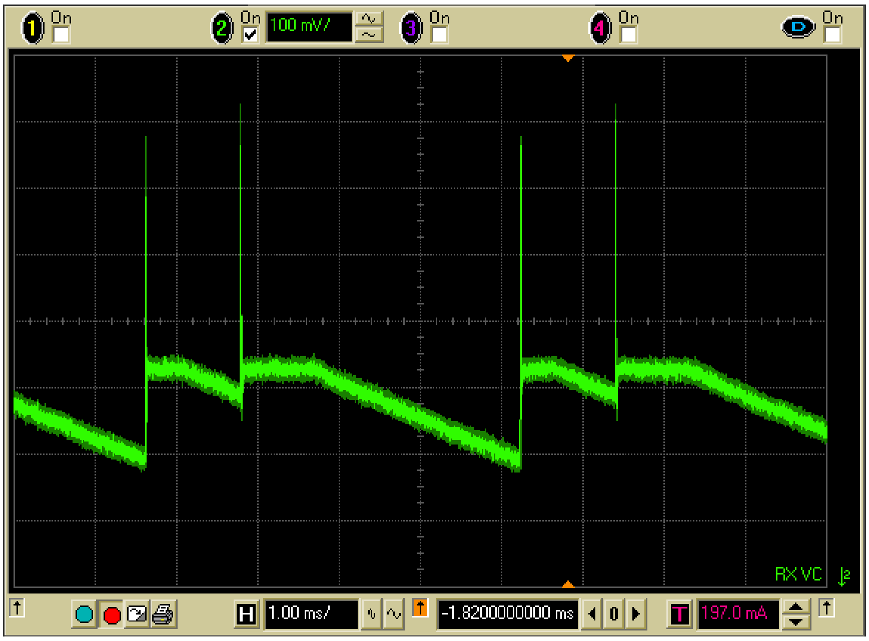

1 On
2 On 200 mV/
3 On
4 On
On
T
RX IQ
H 1.00 ms/
-3.0869290000 ms
0
T 400 mV


1 On
2 On 100 mV/
3 On
4 On
On
Ax
By
Ay
Bx
T
RX IQ
H 50.0 µs/
-3.2748120000 ms
0
T 400.0 mV
Markers
Logic
Scales
?

```
              X                        Y
A——(2) = -3.3039034 ms            506 mV
B---(2) = -3.2893579 ms           706 mV
      Δ =  14.5455 µs             200 mV
   1/ΔX =  68.7500 kHz
```

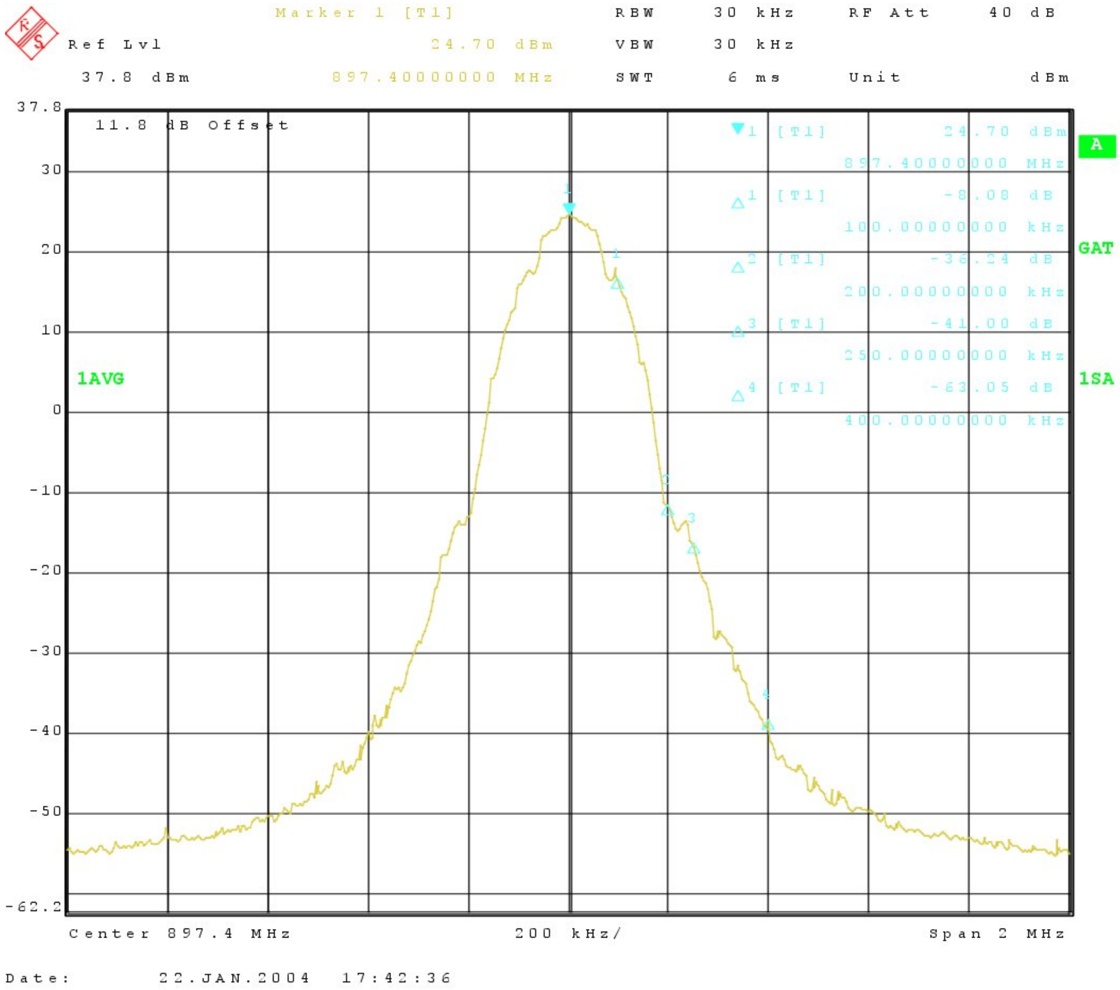
The lower figure is a detail from the upper figure (detail area marked with a white box).

6.5.7 RX VC in GSM mode (DC Offset 1.5 V)


1 On
2 On
100 mV/
3 On
4 On
D On
RX VC
H 1.00 ms/
-1.8200000000 ms
0
T 197.0 mA

DC value changes if channel or band is changed. Upper figure has been taken in EGSM900 band and on channel 37.

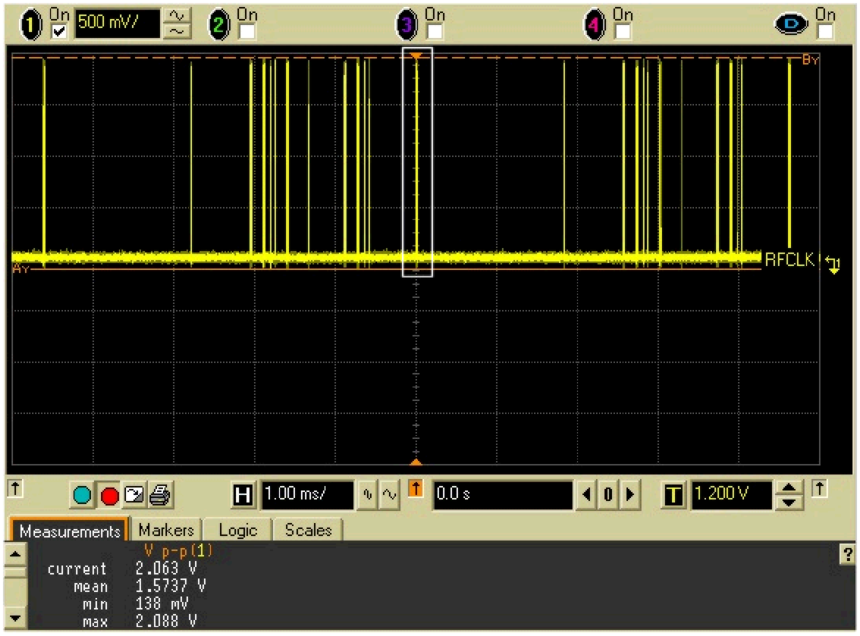
6.5.8 TX Modulation spectrum (GSM)



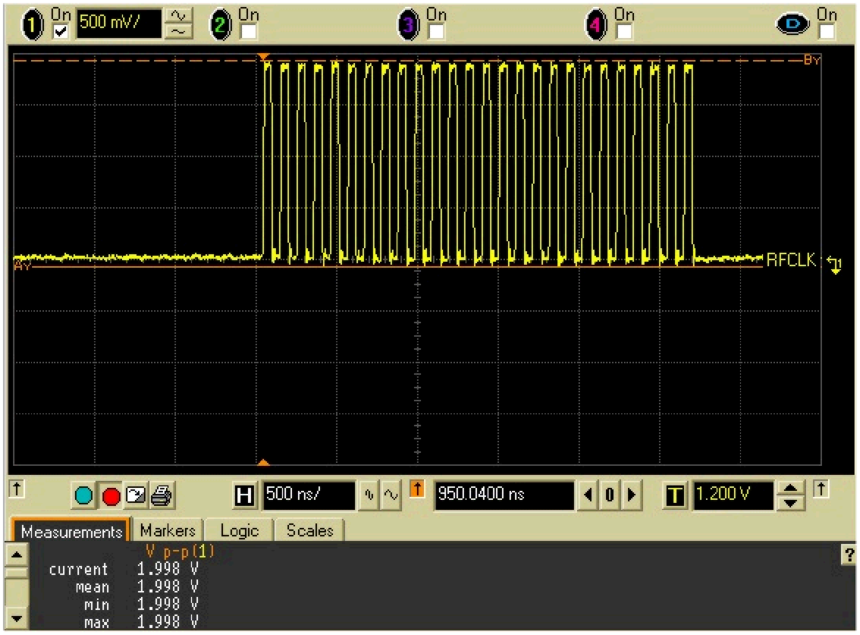
Example of the TX modulation spectrum (GMSK) in EGSM900 band.

6.5.9 RFBUS

6.5.9.1 RFBUSCLK (GSM RX)


On
RFCLK
Measurements
Markers
Logic
Scales

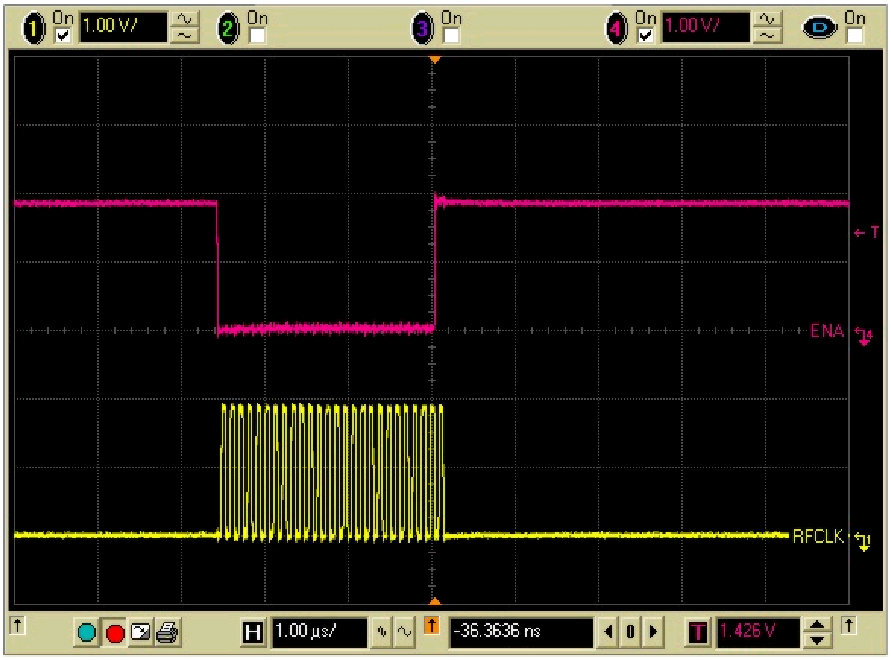
```
H 1.00 ms/    0.0 s    T 1.200 V
1 On ☑ 500 mV/
        V p-p(1)
current  2.063 V
   mean  1.5737 V
    min  138 mV
    max  2.088 V
```


On
RFCLK
Measurements
Markers
Logic
Scales

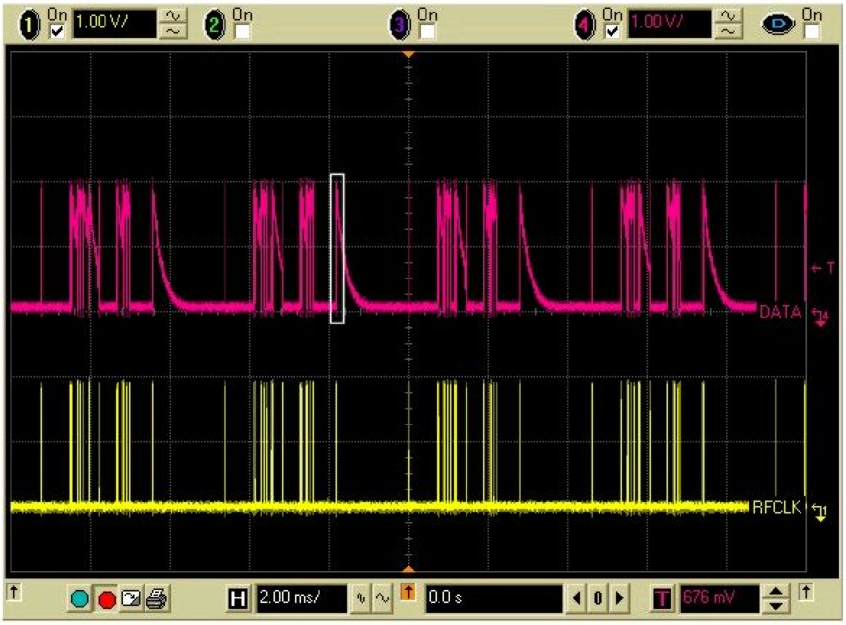
```
H 500 ns/    950.0400 ns    T 1.200 V
1 On ☑ 500 mV/
        V p-p(1)
current  1.998 V
   mean  1.998 V
    min  1.998 V
    max  1.998 V
```

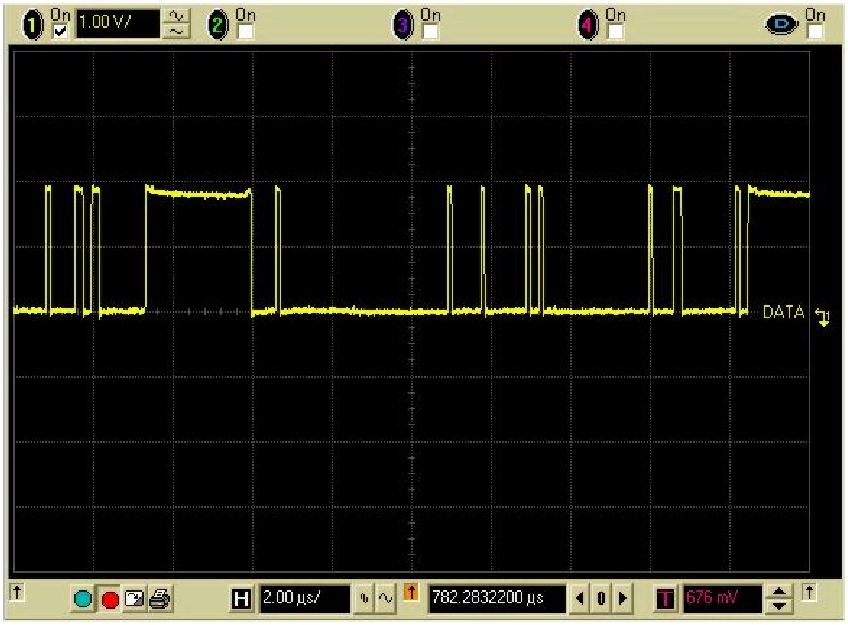
The lower figure is a detail from the upper figure (detail area marked with a white box).

6.5.9.2 RFBUSCLK and RFBUSENA (GSM RX)


1 On ☑ 1.00 V/
2 On ☐
3 On ☐
4 On ☑ 1.00 V/
D On ☐
T
ENA
RFCLK
H 1.00 µs/
-36.3636 ns
0
T 1.426 V

6.5.9.3 RFBUSDAT (GSM RX)


On
1.00 V/
On
On
On
1.00 V/
On
DATA
RFCLK
H 2.00 ms/
0.0 s
T 676 mV


On
1.00 V/
On
On
On
On
DATA
H 2.00 µs/
782.2832200 µs
T 676 mV

The lower figure is a detail from the upper figure (detail area marked with a white box).

8 — Camera Module Troubleshooting

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Table of Contents

Introduction to camera module troubleshooting........8–5
The effect of image taking conditions on image quality........8–6
Camera construction........8–10
Image quality analysis........8–12
  Testing for dust in camera module........8–12
  Testing camera image sharpness........8–13
  Dirty camera lens protection window........8–14
  Image bit errors........8–14
Camera troubleshooting flowcharts........8–16
  Camera hardware failure message troubleshooting........8–16
  Camera baseband HW troubleshooting........8–18
  Camera viewfinder troubleshooting........8–19
  Bad camera image quality troubleshooting........8–20

List of Tables

Table 20 Camera specifications........8–10

List of Figures

Figure 64 Blurred image. Target too close........8–6
Figure 65 Blurring caused by shaking hands........8–7
Figure 66 Near objects get skewed when taking images from a moving vehicle........8–7
Figure 67 Noisy image taken in +70 degrees Celsius........8–8
Figure 68 Image taken against light........8–8
Figure 69 Flicker in an image; object illuminated by strong fluorescent light........8–9
Figure 70 A lens reflection effect caused by sunshine........8–9
Figure 71 Good image taken indoors........8–10
Figure 72 Good image taken outdoors........8–10
Figure 73 Camera module cross section and assembly principle........8–11
Figure 74 Camera module bottom view including serial numbering........8–12
Figure 75 Effects of dust on optical path........8–13
Figure 76 Image taken with clean protection window........8–14
Figure 77 Image taken with greasy protection window........8–14
Figure 78 Bit errors caused by JPEG compression........8–15

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Introduction to camera module troubleshooting

Background, tools and terminology

Faults or complaints in camera operation can be roughly categorised into three subgroups:

1. Camera is not functional at all; no image can be taken.
2. Images can be taken but there is nothing recognizable in them.
3. Images can be taken and they are recognizable but for some reason the quality of images is seriously degraded.

Image quality is very hard to measure quantitatively, and even comparative measurements are difficult (comparing two images) to do, if the difference is small. Especially if the user is not satisfied with his/her device's image quality, and tells, for example, that the images are not sharp, it is fairly difficult to accurately test the device and get an exact figure which would tell whether the device is functioning properly.

Often subjective evaluation has to be used for finding out if a certain property of the camera is acceptable or not. Some training or experience of a correctly operating reference device may be needed in order to detect what actually is wrong.

It is easy for the user to take bad images in bad conditions. Therefore the camera operation has to be checked always in constant conditions (lighting, temperature) or by using a second, known-to-be good device as reference.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems may be expected to appear:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Terms

Dynamic range	Camera's ability to capture details in dark and bright areas of the scene simultaneously.
Exposure time	Camera modules use silicon sensor to collect light and for forming an image. The imaging process roughly corresponds to traditional film photography, in which exposure time means the time during which the film is exposed to light coming through optics. Increasing the time will allow for more light hitting the film and thus results in brighter image. The operation principle is exactly the same with silicon sensor, but the shutter functionality is handled electronically i.e. there is no mechanical moving parts like in film cameras.
Flicker	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
Noise	Variation of response between pixels with same level of input illumination.
Resolution	Usually the amount of pixels in the camera sensor. In some occasions the term resolution is used for describing the sharpness of the images.
Sensitivity	Camera module's sensitivity to light. In equivalent illumination conditions, a less sensitive camera needs a longer exposure time to gather enough light in forming a good image. Analogous to ISO speed in photographic film.

Sharpness	Good quality images are 'sharp' or 'crisp', meaning that image details are well visible in the picture. However, certain issues, such as non-idealities in optics, cause image blurring, making objects in picture to appear 'soft'. Each camera type typically has its own level of performance.

The effect of image taking conditions on image quality

There are some factors, which may cause poor image quality, if not taken into account by the end user when shooting images, and thus may result in complaints. The items listed are normal to camera operation and are not a reason for changing the camera module.

Distance to target

The lens in the module is specified to operate satisfactorily from 64 cm to infinite distance of scene objects. In practice, the operation is such that close objects may be noticed to get more blurred when distance to them is shorter than 64 cm. The lack of sharpness is first visible in full resolution images. If observing just the viewfinder, even very close objects may seem to appear sharp. This is normal; do not change the camera module.

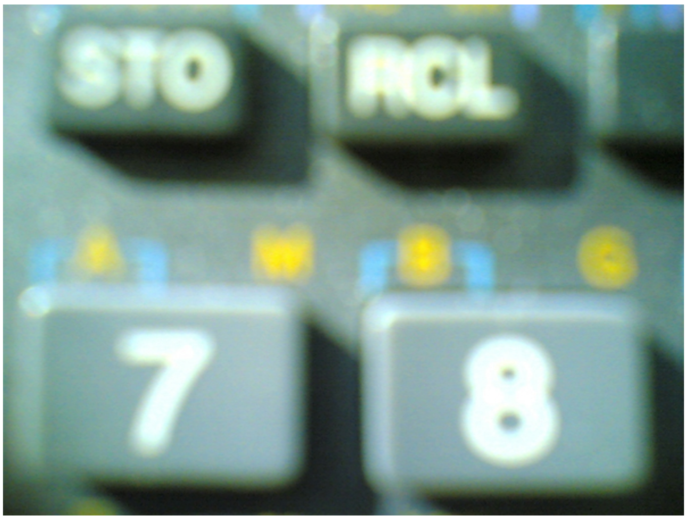


Figure 64 Blurred image. Target too close.

The amount of light available

In dim conditions camera runs out of sensitivity. The exposure time is long (especially in the night mode) and the risk of getting shaken (= blurred) images increases. In addition, image noise level grows. The maximum exposure time in the night mode is ¼ seconds. Therefore, images need to be taken with extreme care and by supporting the phone when the amount of light reflected from the target is low. Because of the longer exposure time and larger gain value, noise level increases in low light conditions. Sometimes blurring may even occur in daytime, if the image is taken very carelessly. See the figure below for an example. This is normal; do not change the camera module.

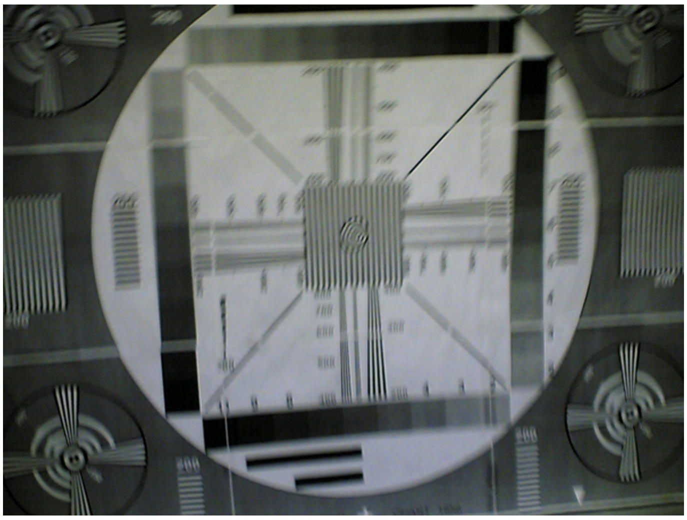


Figure 65 Blurring caused by shaking hands

Movement in bright light

If an image is taken of moving objects or if the device is used in a moving vehicle, object 'skewing' or 'tilting' may occur. This phenomenon is fundamental to most CMOS camera types, and usually cannot be avoided. The movement of camera or object sometimes cause blurring indoors or in dim lighting conditions because of long exposure time. This is normal; do not change the camera module.

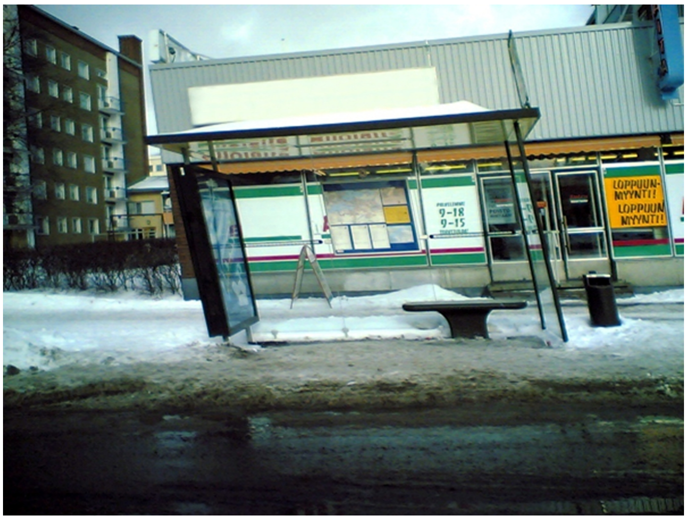


Figure 66 Near objects get skewed when taking images from a moving vehicle

Temperature

High temperatures inside the mobile phone cause more noise to appear in images. For example, in +70 degrees (Celsius), the noise level may be very high, and it further grows if the conditions are dim. If the phone processor has been heavily loaded for a long time before taking an image, the phone might have considerably higher temperature inside than in the surrounding environment. This is also normal to camera operation; do not change the camera module.

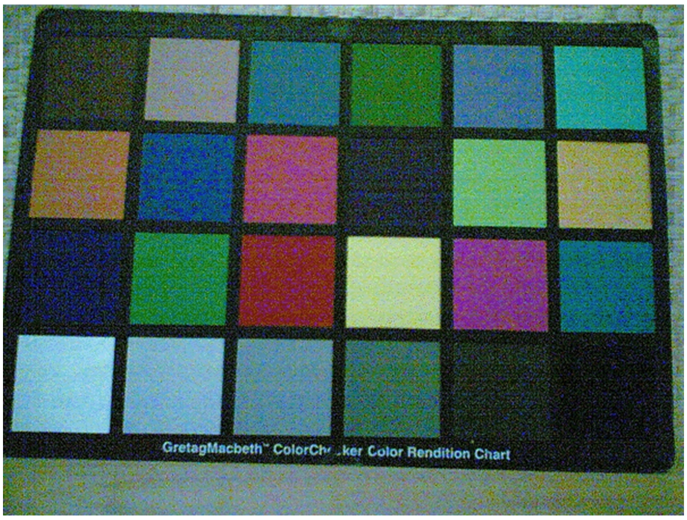


Figure 67 Noisy image taken in +70 degrees Celsius

Phone display

If the display contrast is set too dark, the image quality degrades: the images may be very dark depending on the setting. If the display contrast is set too bright, image contrast appears bad and "faint". This problem is solved by setting the display contrast correctly. This is normal behaviour; do not change the camera module.

Basic rules of photography (especially shooting against light)

Because of dynamic range limitations, taking images against bright light might cause either saturated image or the actual target appear too dark. In practice, this means that when taking an image indoors and having, for example, a window behind the object, the result is usually poor. This is normal behaviour; do not change the camera module.

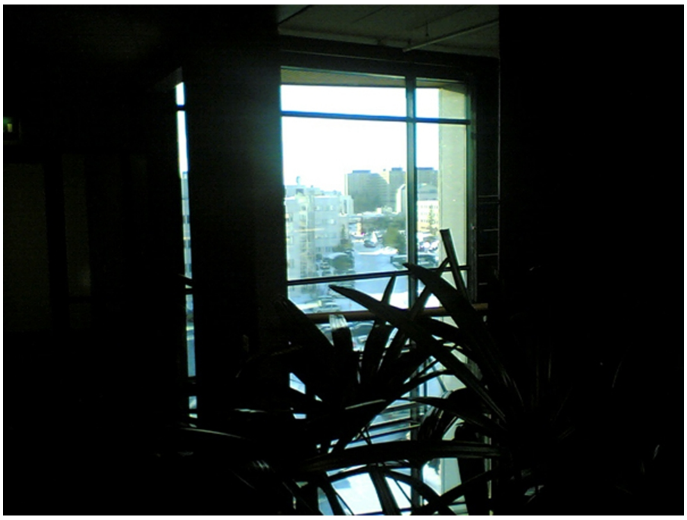


Figure 68 Image taken against light

Flicker

In some occasions a bright fluorescent light may cause flicker in the viewfinder and captured image. This phenomenon may also be a result, if images are taken indoors under the mismatch of 50/60 Hz electricity network frequency. The electricity frequency used is automatically detected by the camera module. In some very few countries, both 50 and 60 Hz networks are present and thus probability for the phenomenon increases. Flickering occurs also under high artificial illumination level. This is normal behaviour; do not change the camera module.

Figure 69 Flicker in an image; object illuminated by strong fluorescent light

Bright light outside of image view

Especially the sun can cause clearly visible lens glare phenomenon and poor contrast in images. This happens because of undesired reflections inside the camera optics. Generally this kind of reflections are common in all optical systems. This is normal behaviour; do not change the camera module.

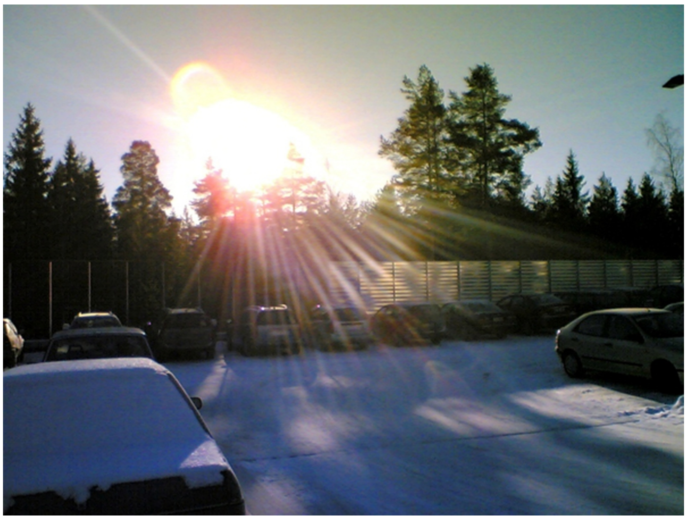


Figure 70 A lens reflection effect caused by sunshine

Examples of good quality images

Figure 71 Good image taken indoors

Figure 72 Good image taken outdoors

Camera construction

This section describes the mechanical construction of the camera module for getting a better understanding of the actual mechanical structure of the module.

Table 20 Camera specifications

Sensor type	CMOS Sensor
Photo detectors	1.9 million
F number/Aperture	f/3.2
Focal length	4.8 mm (35 mm equivalent 37 mm)
Focus range	64 cm to infinity
Still Image resolutions	1600x1200, 640x480
Still images file format	EXIF (JPEG), *.jpg

Video resolutions	352x288, 176x144. Both at 30 frames per second
Video clip length	10 seconds or free, maximal clip length in free mode is 1 hour (limited by the data storing capabilities of the device)
Video file format	3GPP, *.3gp
Exposure	Automatic
White Balance	Automatic
Colours	16.7 million / 24-bit
Capture Modes	Night mode, Sequence mode, self timer

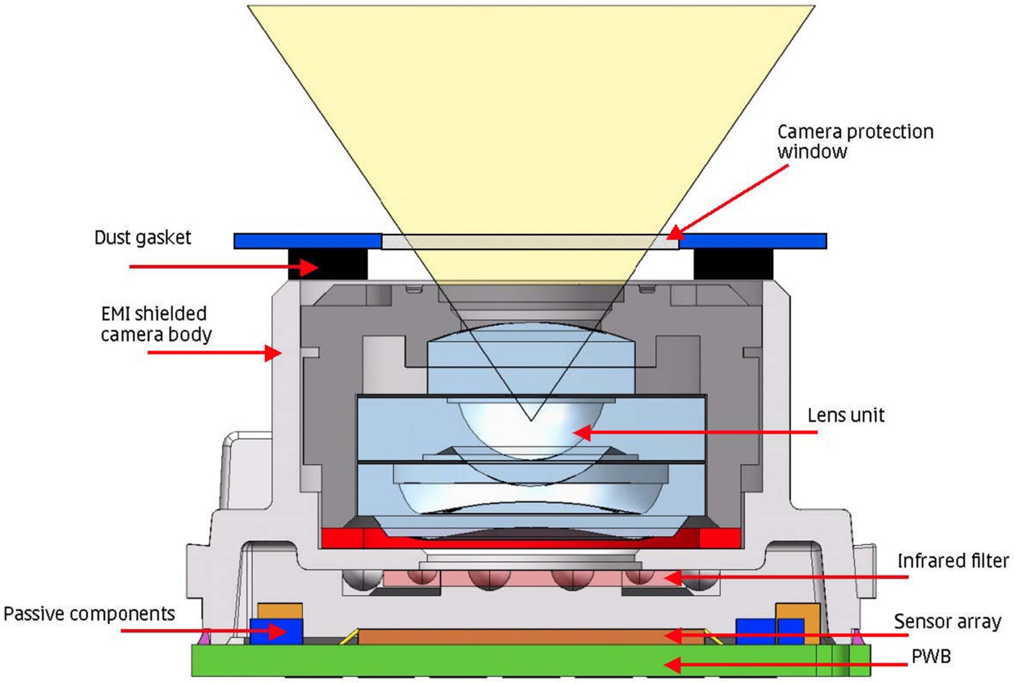

Camera protection window
Dust gasket
EMI shielded camera body
Lens unit
Infrared filter
Passive components
Sensor array
PWB

Figure 73 Camera module cross section and assembly principle

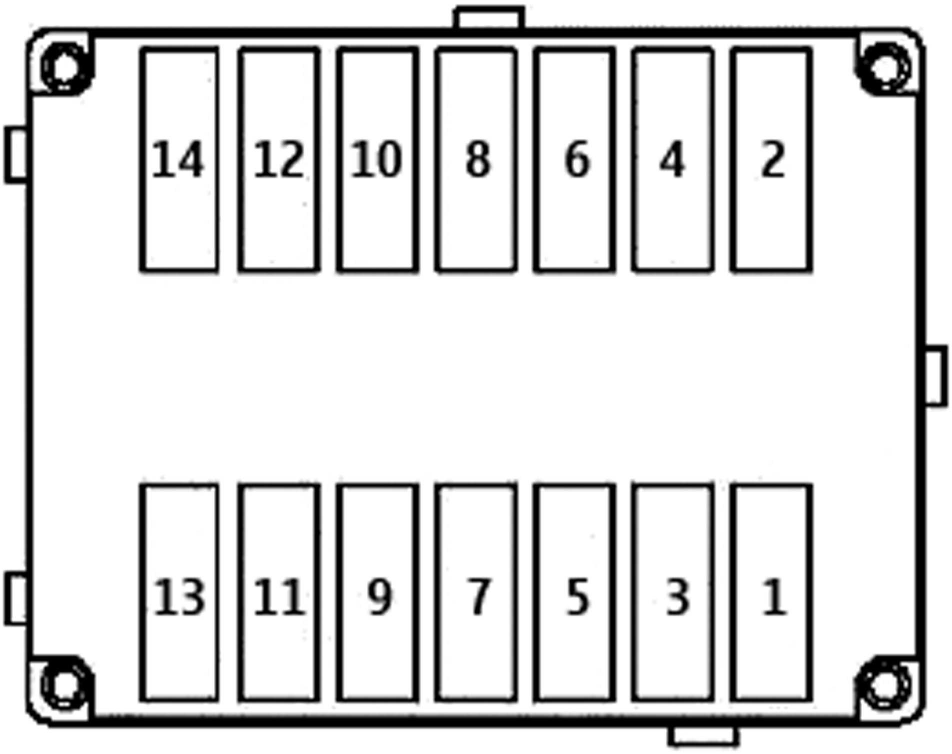


Figure 74 Camera module bottom view including serial numbering

The camera module as a component is not a repairable part, meaning that the components inside the module may not be changed. Cleaning dust from the front face is allowed only. Use clean compressed air.

The camera module uses socket type connecting. For versioning, laser marked serial numbering is used on the PWB.

The main parts of the module are:

- Lens unit including lens aperture.
- Infrared filter; used to prevent infrared light from contaminating the image colours. The IR filter is glued to the EMI shielded camera body.
- Camera body; made of conductive metallized plastic and attached to the PWB with glue.
- Sensor array including DSP functions is glued and wire-bonded to the PWB.
- PWB, FR-4 type
- Passive components
- Camera protection window; part of the phone cover mechanics
- Dust gasket between the lens unit and camera protection window

Image quality analysis

Testing for dust in camera module

Symptoms and diagnosis

For detecting dust problems, take an image of a uniform white surface and analyse it in full resolution. A good quality PC CRT monitor is preferred for analysis (avoid using LCD). Search carefully because finding these defects is not always easy. Figure "Effects of dust on optical path" is an example of an image having easily detectable dust problems.

When taking a white image, use uniformly lightened white paper or white wall. Another option is to use uniform light but in this case make sure that the camera image is not flickering when taking the test image. In case flickering occurs, try to reduce the illumination level. Use JPEG image format for analysing, and set the image quality parameter to ‘High Quality’.

Black spots in an image are caused by dirt particles trapped inside the optical system. Clearly visible and sharp edged black dots in an image are typically dust particles on the image sensor. These spots are searched for in the manufacturing phase, but it is possible that the camera body cavity contains a particle, which may move onto the image sensor active surface, for example, when the phone is dropped. Therefore it is also possible that the problem will disappear before the phone is brought to service. The camera should be replaced if the problem is present when the service technician analyses the phone.

If dust particles are lying on the infrared filter surface on either side, they are hard to locate because they are out of focus, and appear in the image as large, grayish and fading-edge 'blobs'. Sometimes they are invisible to the eye, and the user probably does not notice them at all. However, it is possible that a larger particle disturbs the user, causing need for service.

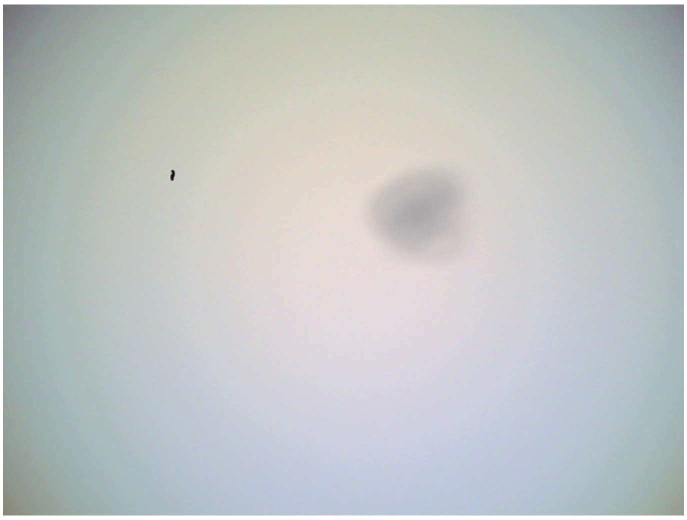


Figure 75 Effects of dust on optical path

If large dust particles get trapped on top of the lens surface in the cavity between the camera window and the lens, they will cause image blurring and poor contrast. The dust gasket between the window and lens should prevent any particles from getting into the cavity after the manufacturing phase.

If dust particles are found on the sensor, this is classified as a manufacturing error of the module, and the camera should be replaced. Any particles inside the cavity between the protection window and the lens have most probably been trapped there in the assembly phase at a Nokia factory. Unauthorized disassembling of the product can also be the root of the problem. However, in most cases it should be possible to remove the particle(s) by using clean compressed air. Never wipe the lens surface before trying compressed air; the possibility of damaging the lens is substantial. Always check the image sharpness after removing dust.

Testing camera image sharpness

Symptoms and diagnosis

If pictures taken with a device are claimed to be blurry, there are six possible sources for the problem:

1. The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.
2. The photographed object is too close – the camera lens operates with distances from 64 cm to infinity. This is no cause to replace camera module.
3. User has tried to take pictures in too dark conditions, and images are blurred due to handshake or movement. This is no cause to replace camera module.

4 There is dirt between the protection window and camera lens.

5 The protection window is defective. This can be either a manufacturing failure or caused by the user. The window should be changed.

6 The camera lens is misfocused because of a manufacturing error.

A quantitative analysis of sharpness is very difficult to conduct in any other environment than optics laboratory. Therefore, subjective analysis should be used.

If no visible defects (items 1-4) are found, a couple of test images should be taken. Generally, a well-illuminated typical indoor scene can be used as a target. The main considerations are:

- The protection window has to be clean.
- The amount of light (300 – 600 lux (bright office lighting)) is sufficient.
- The scene should contain, for example, small objects for checking sharpness. Their distance should be 1 – 2 meters.
- If possible, compare the image to another image of the same scene, taken with a different device. Note that the reference device has to be a similar Nokia phone.

Steps

1. Take several images of small objects in the distance of 1-2 metres.
2. Analyse the images on a PC screen at 100% scaling with the reference images.

   Pay attention to the computer display settings: at least 65000 colors (16-bit) have to be used. True colour (24-bit, 16 million colours) or 32-bit (full colour) setting is recommended.

Next action

If there appears to be a clearly noticeable difference between the reference image and the test images, the module might have a misfocused lens -> change the module.

Re-check the resolution after changing the camera module.

If the changed module produces the same result, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module.

Dirty camera lens protection window

The following series of images demonstrates the effects of fingerprints on the camera protection window.

It should be noted that the effects of any dirt in images can vary much. It may be difficult to judge whether the window has been dirty or if something else is wrong. Therefore, the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

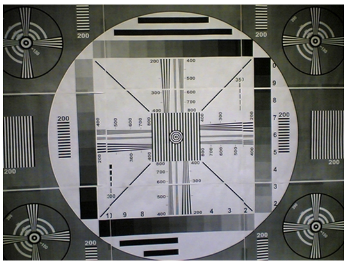
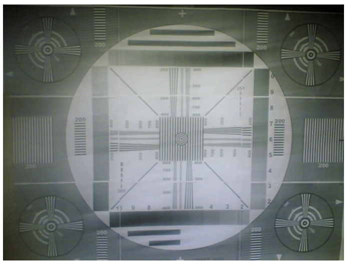
 **Figure 76 Image taken with clean protection window**	 **Figure 77 Image taken with greasy protection window**

Image bit errors

Bit errors are image defects caused by data transmission errors between the camera module and the phone baseband and/or errors inside the module.

Usually bit errors can be easily detected in images, and they are best visible in full resolution images. A good practice is to use a uniform white test target when analysing these errors. The errors are clearly visible, colourful sharp dots or lines in camera images. See the following figure.

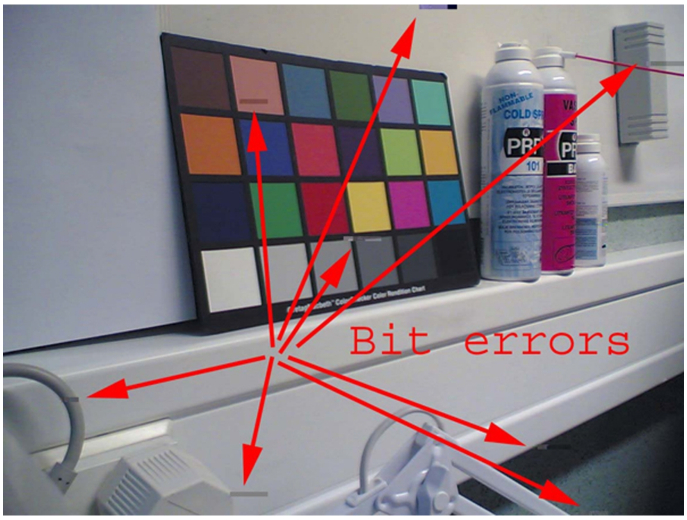


Figure 78 Bit errors caused by JPEG compression

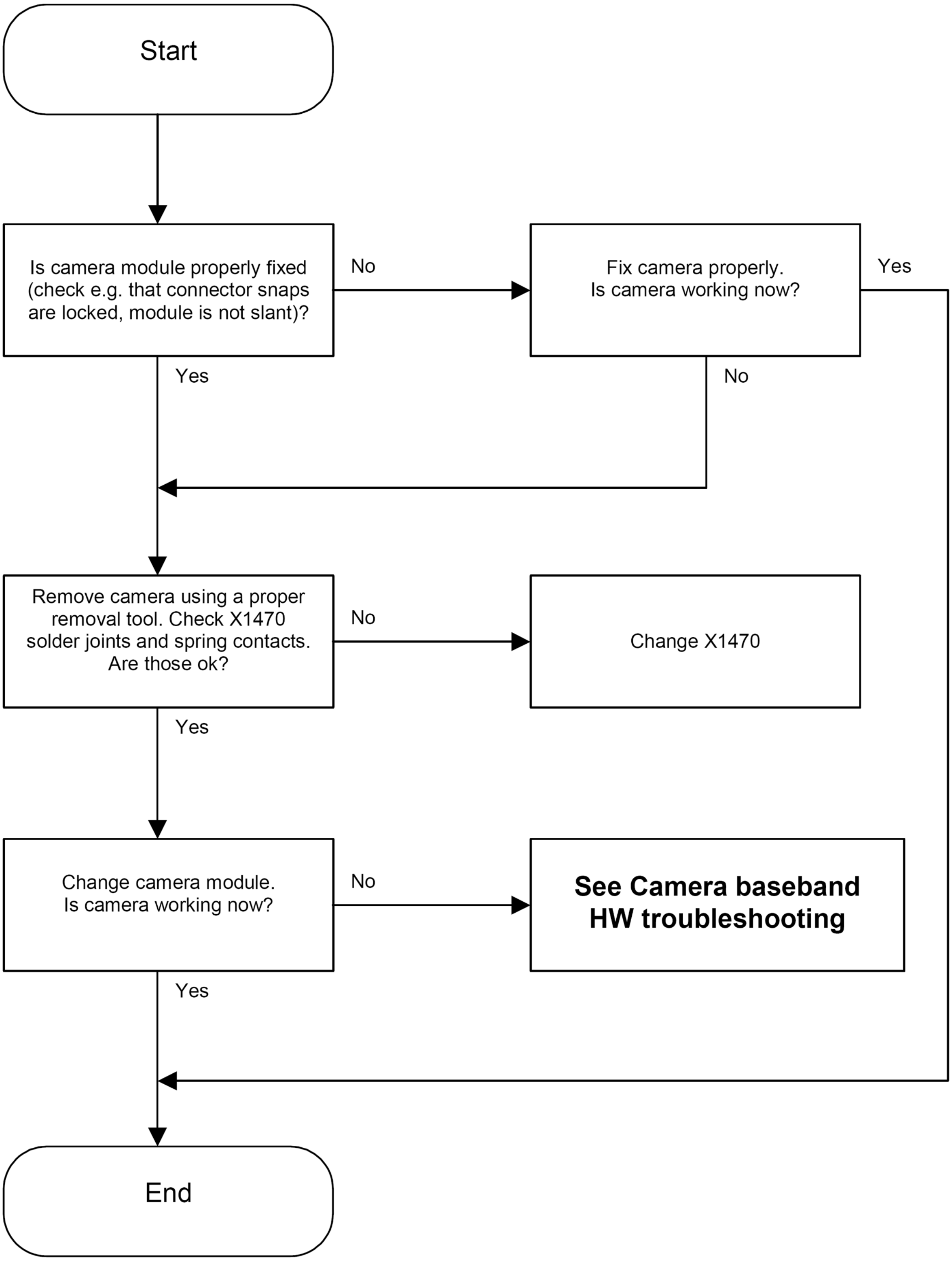
One type of bit error is a lack of bit depth. In this case, the image is almost totally black under normal conditions, and only senses something in very highly illuminated environments. Typically this is a contact problem between the camera module and the phone main PWB. You should check the camera assembly and connector contacts.

If the fault is in the camera module, bit errors are typically visible only when using some specific image resolution. For example, in case of a viewfinder fault, the error might exist but is not visible in a full size image.

Camera troubleshooting flowcharts

Camera hardware failure message troubleshooting

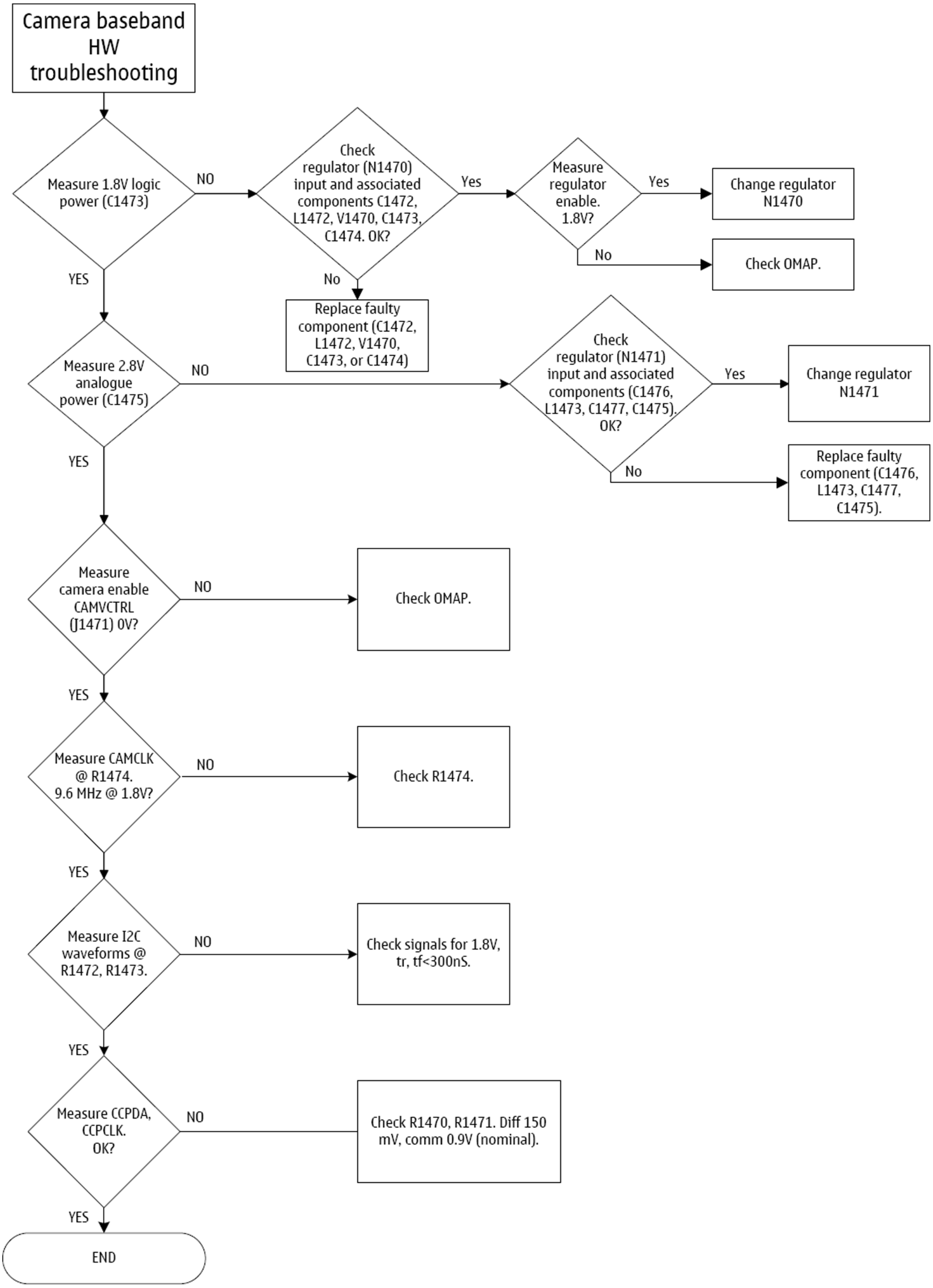
Troubleshooting flow


Start
Is camera module properly fixed (check e.g. that connector snaps are locked, module is not slant)?
No
Fix camera properly. Is camera working now?
Yes
Yes
No
Remove camera using a proper removal tool. Check X1470 solder joints and spring contacts. Are those ok?
No
Change X1470
Yes
Change camera module. Is camera working now?
No
See Camera baseband HW troubleshooting
Yes
End

Note: Make sure that the phone has the latest software before continuing.

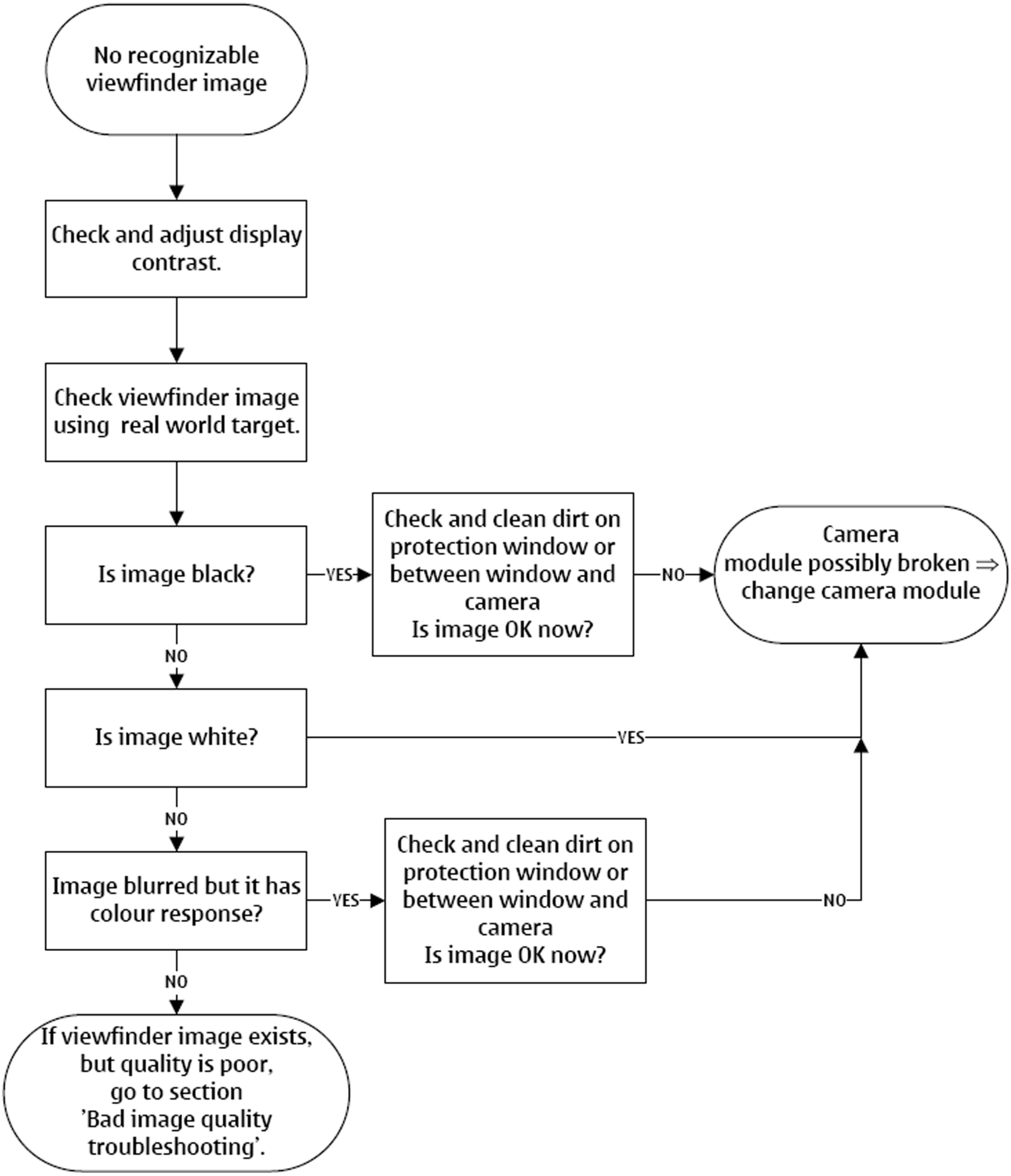
Camera baseband HW troubleshooting

Troubleshooting flow


Camera baseband HW troubleshooting
Measure 1.8V logic power (C1473)
NO
Check regulator (N1470) input and associated components C1472, L1472, V1470, C1473, C1474. OK?
Yes
Measure regulator enable. 1.8V?
Yes
Change regulator N1470
No
Check OMAP.
No
Replace faulty component (C1472, L1472, V1470, C1473, or C1474)
YES
Measure 2.8V analogue power (C1475)
NO
Check regulator (N1471) input and associated components (C1476, L1473, C1477, C1475). OK?
Yes
Change regulator N1471
No
Replace faulty component (C1476, L1473, C1477, C1475).
YES
Measure camera enable CAMVCTRL (J1471) 0V?
NO
Check OMAP.
YES
Measure CAMCLK @ R1474. 9.6 MHz @ 1.8V?
NO
Check R1474.
YES
Measure I2C waveforms @ R1472, R1473.
NO
Check signals for 1.8V, tr, tf<300nS.
YES
Measure CCPDA, CCPCLK. OK?
NO
Check R1470, R1471. Diff 150 mV, comm 0.9V (nominal).
YES
END

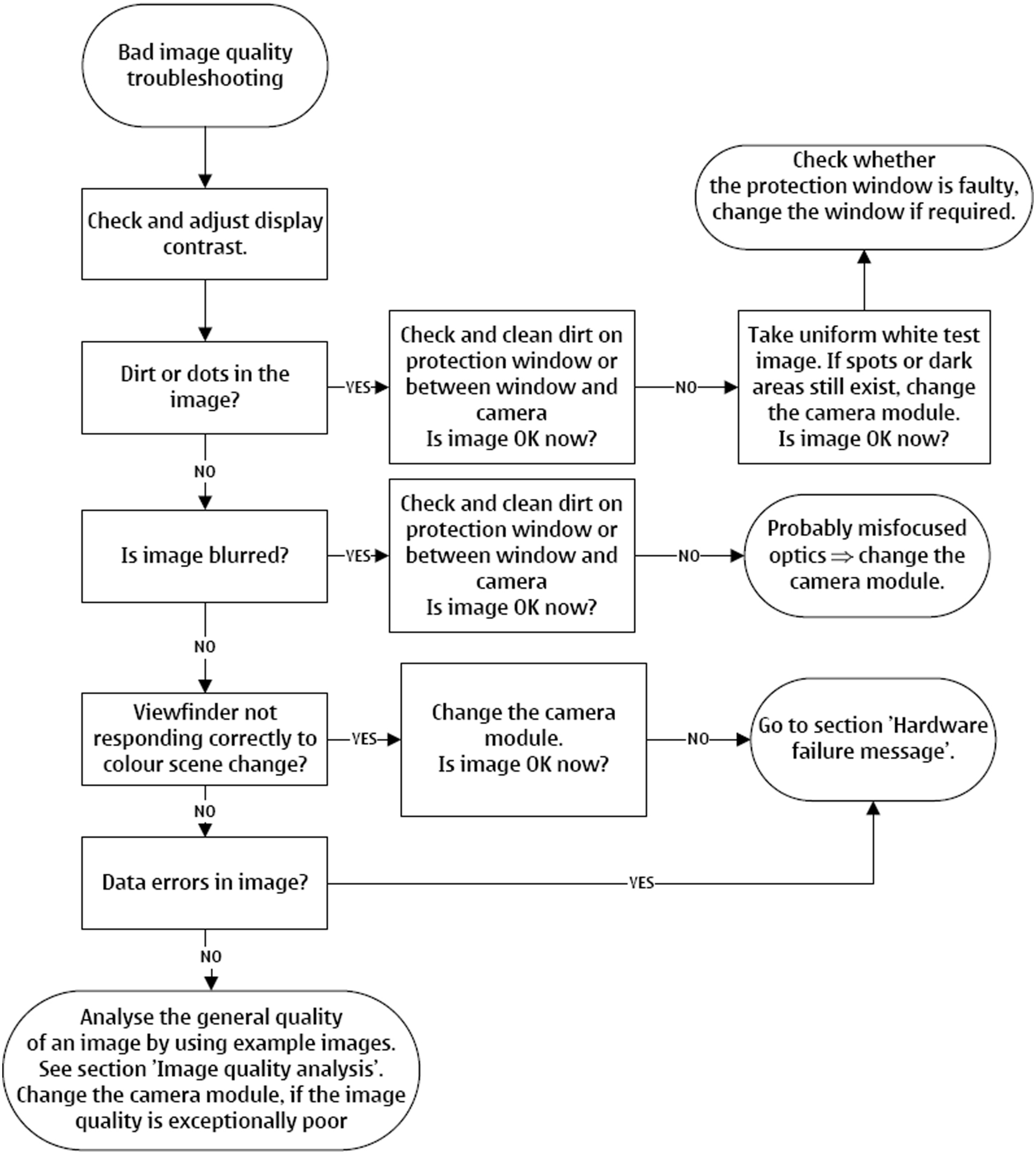
Camera viewfinder troubleshooting

Troubleshooting flow


No recognizable viewfinder image
Check and adjust display contrast.
Check viewfinder image using real world target.
Is image black?
YES
Check and clean dirt on protection window or between window and camera
Is image OK now?
NO
Camera module possibly broken ⇒ change camera module
NO
Is image white?
YES
NO
Image blurred but it has colour response?
YES
Check and clean dirt on protection window or between window and camera
Is image OK now?
NO
NO
If viewfinder image exists, but quality is poor, go to section 'Bad image quality troubleshooting'.

Bad camera image quality troubleshooting

Troubleshooting flow


Bad image quality troubleshooting
Check and adjust display contrast.
Dirt or dots in the image?
YES
Check and clean dirt on protection window or between window and camera
Is image OK now?
NO
Take uniform white test image. If spots or dark areas still exist, change the camera module.
Is image OK now?
Check whether the protection window is faulty, change the window if required.
NO
Is image blurred?
YES
Check and clean dirt on protection window or between window and camera
Is image OK now?
NO
Probably misfocused optics ⇒ change the camera module.
NO
Viewfinder not responding correctly to colour scene change?
YES
Change the camera module.
Is image OK now?
NO
Go to section 'Hardware failure message'.
NO
Data errors in image?
YES
NO
Analyse the general quality of an image by using example images. See section 'Image quality analysis'. Change the camera module, if the image quality is exceptionally poor

9 — System Module

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Table of Contents

Baseband description....9–7
    System module block diagram....9–7
    Baseband functional description....9–8
    Absolute maximum ratings....9–10
    Phone modes of operation....9–11
    Power distribution....9–13
    Clocking scheme....9–14
    BRF6150 Bluetooth....9–15
    WLAN interface....9–15
    USB....9–15
    SIM interface....9–16
    HDD interface....9–16
    Battery interface....9–18
    Camera interface....9–19
    User interface....9–19
        Display interface....9–19
        Keyboard....9–20
        Display and keyboard backlight....9–21
    ASICs....9–21
        RAP ASIC....9–21
        EM ASIC N2200....9–21
        EM ASIC N2300....9–21
    Device memories....9–22
        RAP memories NOR flash and SDRAM....9–22
        Combo memory....9–22
Audio concept....9–24
    Audio HW architecture....9–24
    Internal microphone....9–25
    External microphone....9–26
    Internal earpiece....9–26
    Internal speaker....9–27
    External earpiece....9–27
    Vibra circuitry....9–29
    3.5 mm audio data combo jack....9–29
Baseband technical specifications....9–30
    External interfaces....9–30
        External interfaces....9–30
        ACI interface electrical characteristics....9–31
        VOUT electrical characteristics....9–31
        USB IF electrical characteristics....9–31
        FBUS interface electrical characteristics (between RAP and N2300)....9–32
        Headset hook detection interface (XMICN) electrical characteristics....9–33
        Audio signal electrical characteristics....9–33
        SIM IF connections....9–33
        Charger connector and charging interface connections & electrical characteristics....9–34
        Battery connector and interface connections & electrical characteristics....9–35
        WLAN interface signals....9–35
    Internal interfaces....9–36
        Internal interfaces....9–36
        UI module connector and IF connections....9–37

Keyboard interface electrical characteristics....9–37
Display interface connections....9–38
Camera interface connections and electrical characteristics....9–39
HDD interface connection and electrical characteristics....9–41
Back-up battery interface connections and electrical characteristics....9–42
RF description....9–42
Receiver....9–42
Introduction to receiver functionality....9–42
WCDMA receiver functionality....9–42
GSM receiver functionality....9–43
Transmitter....9–43
Introduction to transmitter functionality....9–43
WCDMA transmitter functionality....9–43
GSM transmitter functionality....9–44
Frequency synthesizers....9–44
Regulators....9–45
Frequency mappings....9–46
EGSM900 frequencies....9–46
GSM1800 frequencies....9–47
GSM1900 frequencies....9–48
WCDMA 2100 Rx frequencies....9–49
WCDMA 2100 Tx frequencies....9–50

List of Tables

Table 21 Keymatrix....9–20
Table 22 LED driver control signals....9–21
Table 23 Combo memory interface signals....9–23
Table 24 Supply voltages for combo memory interfaces....9–24
Table 25 3.5 mm 4-pole audio jack connections....9–30
Table 26 Charging interface connections....9–34
Table 27 Charging IF electrical characteristics....9–34
Table 28 Battery interface connections....9–35
Table 29 Battery IF electrical characteristics....9–35
Table 30 Slider pogo pins....9–37
Table 31 Camera interface connections....9–39
Table 32 Camera CCP IF electrical characteristics....9–40
Table 33 Camera supply voltage characteristics....9–40
Table 34 Camera control IF electrical characteristics....9–40
Table 35 HDD interface connections 9–41
Table 36 HDD interface connections electrical specifications 9–42
Table 37 Back-up battery connections....9–42
Table 38 Back-up battery electrical characteristics....9–42

List of Figures

Figure 79 System level block diagram....9–8
Figure 80 Functional block diagram....9–9
Figure 81 Application processor engine high level block diagram....9–9
Figure 82 Power distribution diagram....9–13
Figure 83 Clocking scheme....9–15
Figure 84 SIM interface....9–16

Figure 85 HDD interface....................9–17
Figure 86 HDD data transfer....................9–17
Figure 87 Application processor data transfer....................9–18
Figure 88 Application processor HDD initialisation....................9–18
Figure 89 Battery pin order....................9–19
Figure 90 General diagram of the LCD module....................9–19
Figure 91 Combo memory block diagram....................9–23
Figure 92 Audio block diagram....................9–25
Figure 93 Internal microphone circuitry....................9–26
Figure 94 External microphone circuitry....................9–26
Figure 95 Internal earpiece circuitry....................9–27
Figure 96 Internal speaker circuitry....................9–27
Figure 97 Vibra circuitry....................9–29
Figure 98 View of 3.5 mm audio data combo jack....................9–30
Figure 99 Charger connector....................9–34
Figure 100 Battery connector....................9–35
Figure 101 UI components....................9–37
Figure 102 HDD interface connector....................9–41
Figure 103 GSM transmitter....................9–44

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Baseband description

System module block diagram

The device consists of a single transceiver main board that interfaces to peripheral devices via pogo sticks, spring contacts, and other connector types. The main board contains the following:

- Baseband components
- RF components
- Key domes
- Keypad backlights
- Navigation joystick

The peripheral devices are mainly part of the mechanics and make contact to the main board when the entire unit is secured together with screws. Peripheral devices include the following:

- Antennas
- Microphone
- Speakers
- Vibra
- Hard drive
- Music keypad
- Camera
- LCD display

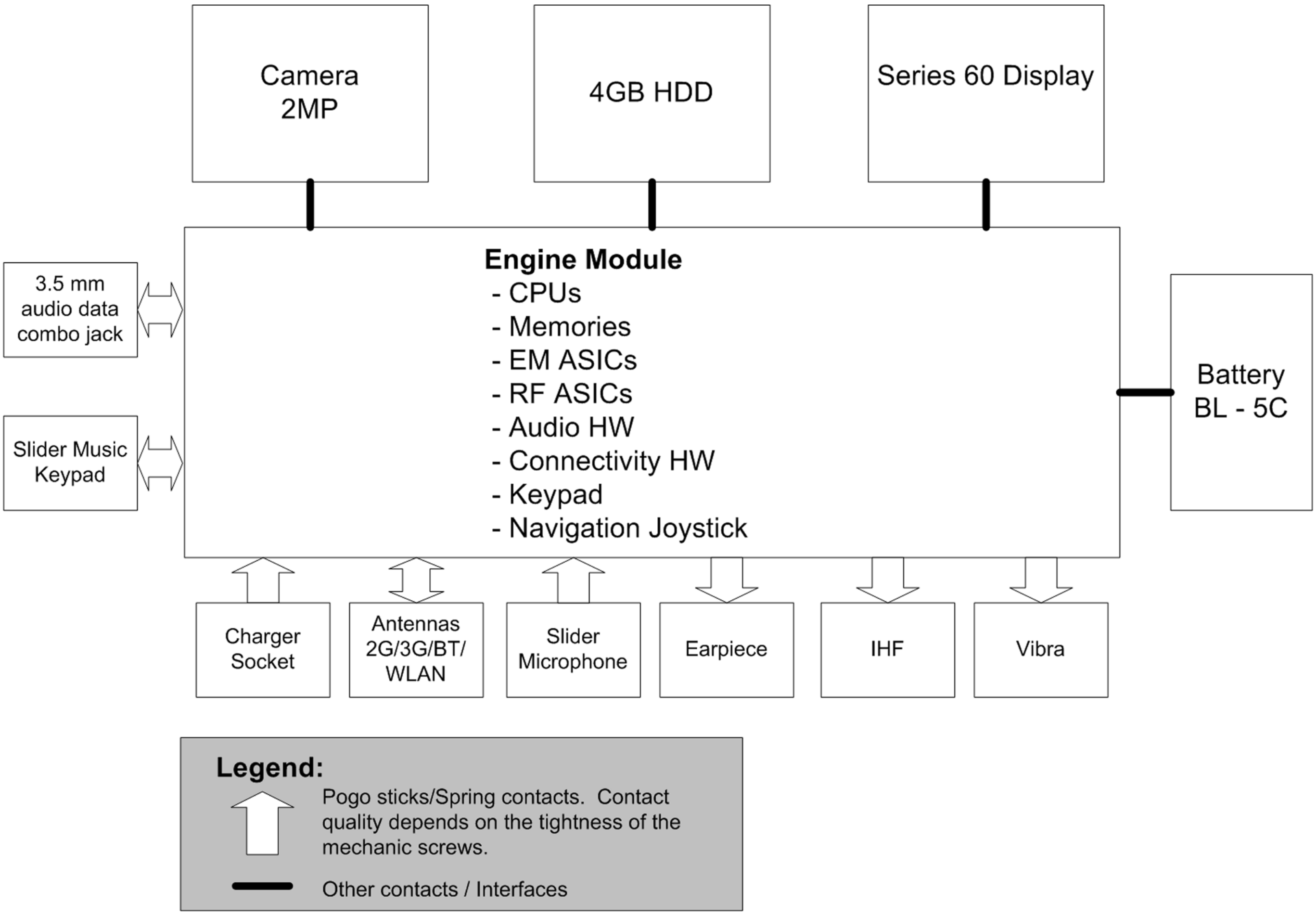

Camera
2MP
4GB HDD
Series 60 Display
Engine Module
- CPUs
- Memories
- EM ASICs
- RF ASICs
- Audio HW
- Connectivity HW
- Keypad
- Navigation Joystick
3.5 mm audio data combo jack
Slider Music Keypad
Battery BL - 5C
Charger Socket
Antennas 2G/3G/BT/ WLAN
Slider Microphone
Earpiece
IHF
Vibra
Legend:
Pogo sticks/Spring contacts. Contact quality depends on the tightness of the mechanic screws.
Other contacts / Interfaces

Figure 79 System level block diagram

Baseband functional description

Digital baseband consists of an ISA based modem and Symbian based application sections. The modem functionality is in RAP, and application processor engine acts as a platform for Symbian applications.

Modem section consists of RAP ASIC with NOR FLASH and SDRAM memory as the core. RAP supports cellular protocols of WCDMA (3GPP R-4) and GSM (minimum EDGE glass 10, GPRS phase2). Modem SDRAM memory have 64 Mbits of memory and NOR flash have 64 Mbits of memory. RAP operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

Application section includes an application processor with DDR/NAND combo memory as the core. Stacked DDR/NAND application memory has 512 Mbits of DDR memory and 512 Mbits of flash memory. The application processor uses a 19.2 MHz clock, which comes from the RAP divided by two from the 38.4 MHz system clock.

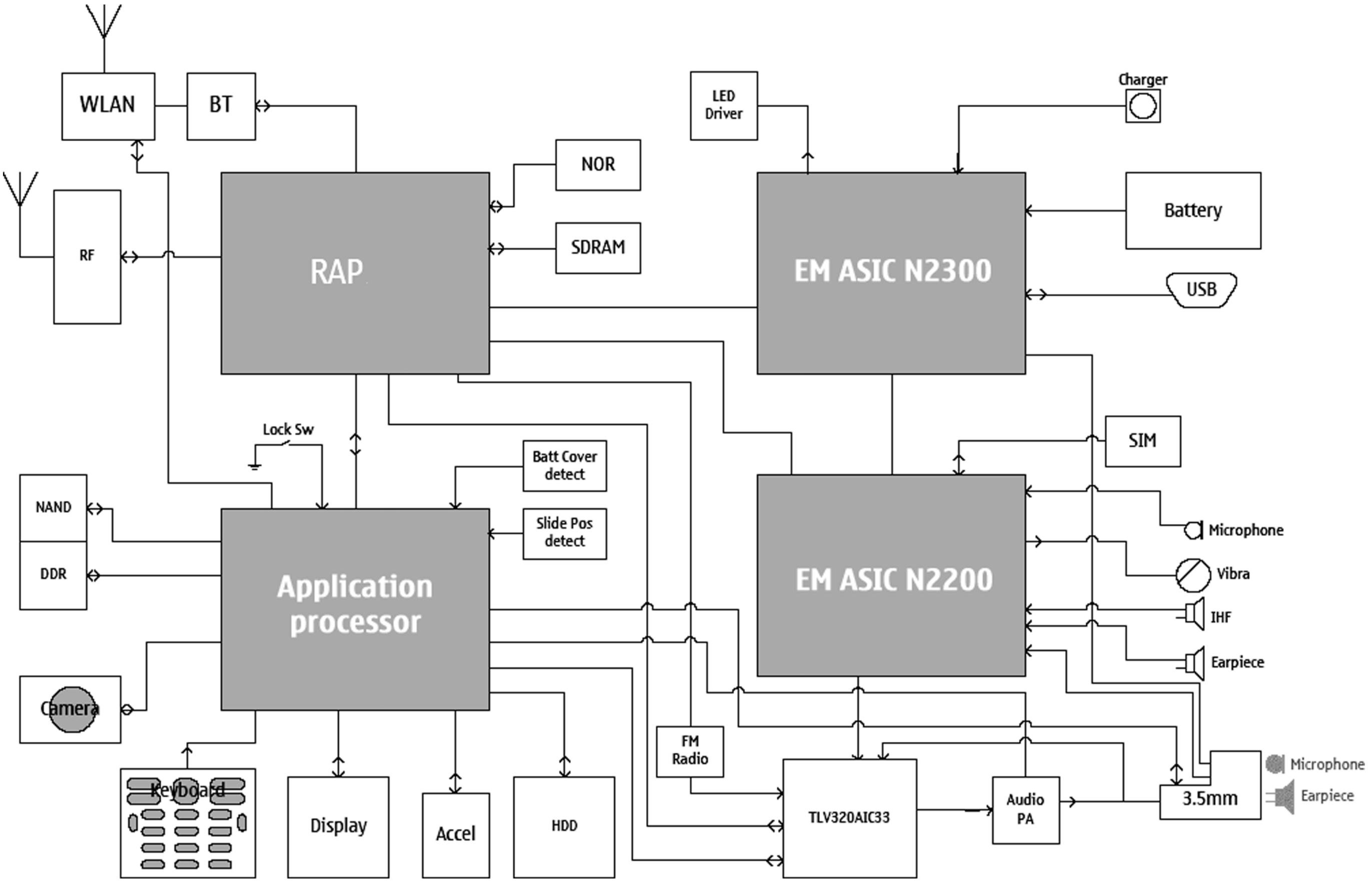

WLAN
BT
RF
RAP
NOR
SDRAM
LED Driver
Charger
EM ASIC N2300
Battery
USB
Lock Sw
Batt Cover detect
Slide Pos detect
SIM
NAND
DDR
Application processor
EM ASIC N2200
Microphone
Vibra
IHF
Earpiece
Camera
FM Radio
Keyboard
Display
Accel
HDD
TLV320AIC33
Audio PA
3.5mm
Microphone
Earpiece

Figure 80 Functional block diagram

The application processor is also called as an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like camera, display, and keyboard driver blocks.

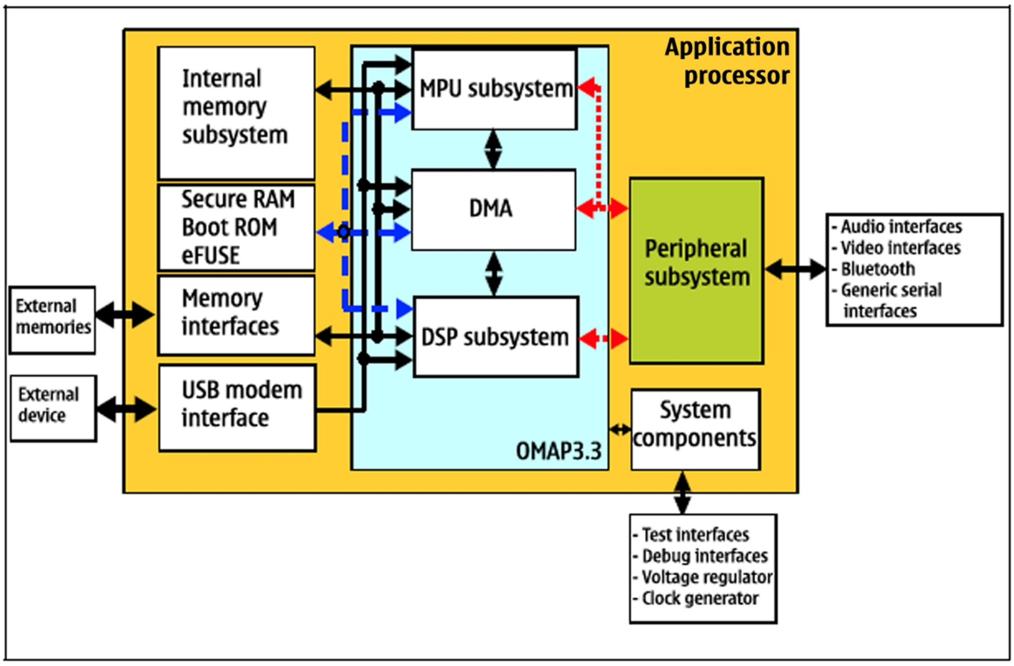

Application processor
Internal memory subsystem
Secure RAM
Boot ROM
eFUSE
Memory interfaces
USB modem interface
External memories
External device
MPU subsystem
DMA
DSP subsystem
OMAP3.3
Peripheral subsystem
System components
- Audio interfaces
- Video interfaces
- Bluetooth
- Generic serial interfaces
- Test interfaces
- Debug interfaces
- Voltage regulator
- Clock generator

Figure 81 Application processor engine high level block diagram

Section	Description
Application processor	also called an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like camera, display and keyboard driver blocks.
OMAP3.3	consists of ARM926 (MPU subsystem), TMS320C55x (DSP subsystem), DMA and OMAP3.3s internal peripherals.
MPU subsystem	based on an ARM926EJ. MPU is able to perform most of the application operations on the chip.
System DMA component	mainly used to help the MPU and DSP perform data memory transfer-specific tasks, leaving more available MIPS for both processors.
DSP subsystem	based on a TMS320C55x™ DSP core, which is responsible for intensive data computing tasks like real-time audio and video handling on application side, e.g. voice recording.
Internal memory subsystem	composed of a single port SRAM.
Secure modules	Application processor contains a set of several components, including ROM, a single port SRAM, and eFUSE cells. These components enable the system to support secure applications.
Memory interfaces	The memory interfaces define the system memory access organization of application processor.
USB & modem interface	These two modules enable the platform to support a universal serial link and a dedicated modem interface, enabling a high data transfer rate between the modem and the application chip.
System components	System components are group of modules responsible for managing system interactions such as interrupt, clock control and idle.
Peripheral subsystem	The peripheral subsystem defines all the components used to interface application processor with specific external devices such as camera, keyboard, display, etc.

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)	+3.2		+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+20	V	

Signal	Min	Nom	Max	Unit	Notes
Back-Up supply voltage	0	2.5	2.6	V	Maximum capacity of the backup power supply assumed to be 10 µAh.

Phone modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below N2200 master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over N2200 master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. In this mode certain regulators are enabled and after they and RFClk have stabilized, the system reset (PurX) is released and PWR_ON mode entered. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16 ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low. There are in principle three different sleep modes: • Application processor sleep • RAP sleep • Application processor and RAP sleep (deep sleep) In SLEEP mode N2200's regulators VIO, VDRAM, VSIM1, VSIM2, VAUX and Vana are in low quiescent current mode (output voltages still present but regulators will not give as much current out). Other regulators including VR1 supplying system clock oscillator are disabled. In SLEEP mode, N2300 VCORE SMPS regulator is in low quiescent current mode (if sleep mode is not internally disabled). Linear regulator VOUT state depends on the accessory connected to the system connector, if there is any.
FLASHING	FLASHING mode is for SW downloading.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (N2300)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)

Parameter	Description	Value
SWCOFF	SW cutoff limit	~3.2V

The master reset threshold controls the internal reset of N2200 / (N2300). If battery voltage is above VMSTR, N2300's charging control logic is alive. Also, RTC is active and supplied from the main battery. Above VMSTR, N2300 allows the system to be powered on although this may not succeed due to voltage drops during start up. SW can also consider battery voltage too low for operation and power down the system.

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). Power on key is connected to N2200 ASIC via PWRONX signal.

Power distribution

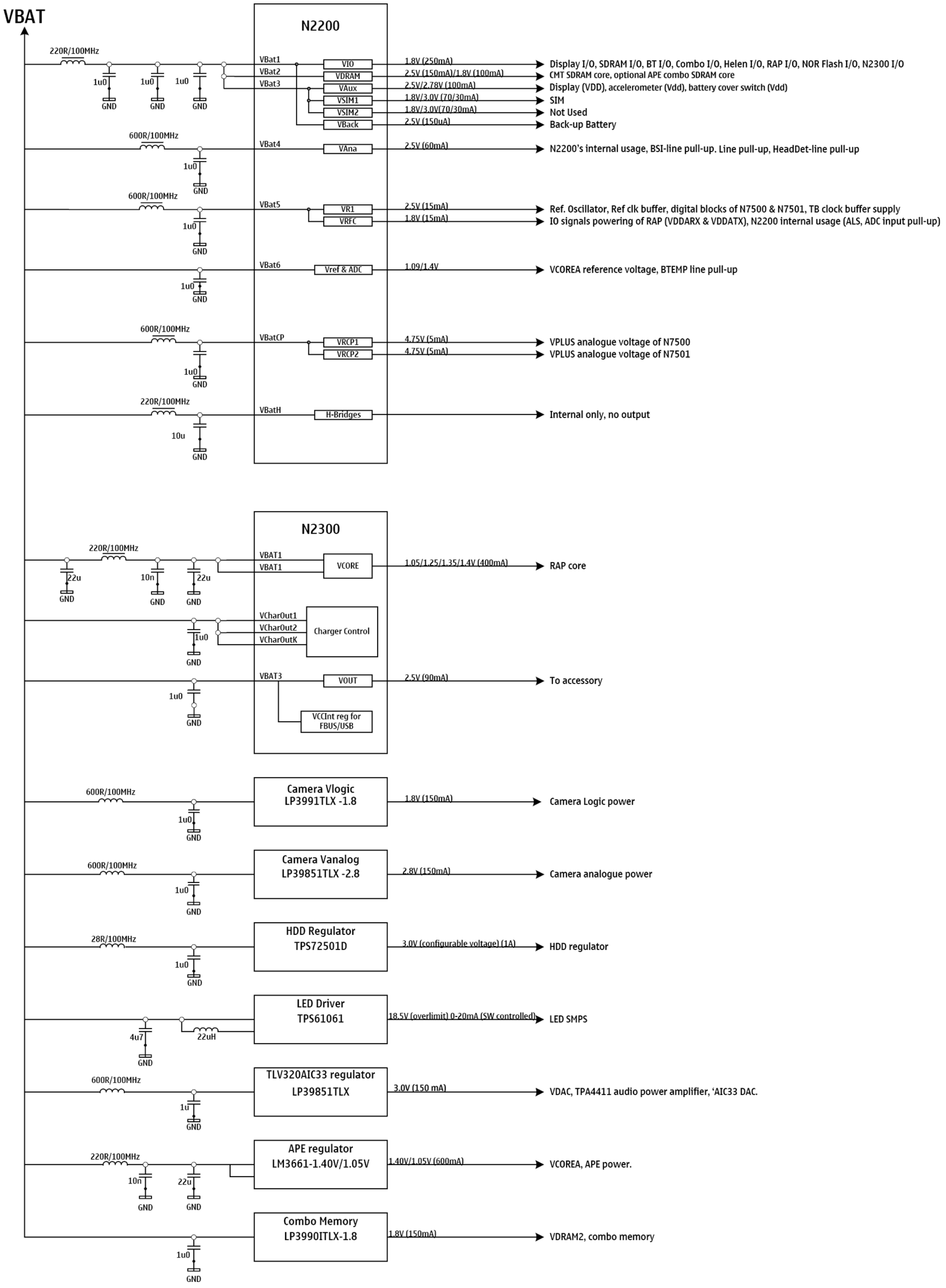

VBAT
N2200
220R/100MHz
1u0
1u0
1u0
GND
VBat1
VBat2
VBat3
VIO
VDRAM
VAux
VSIM1
VSIM2
VBack
1.8V (250mA)
2.5V (150mA)/1.8V (100mA)
2.5V/2.78V (100mA)
1.8V/3.0V (70/30mA)
1.8V/3.0V(70/30mA)
2.5V (150uA)
Display I/O, SDRAM I/O, BT I/O, Combo I/O, Helen I/O, RAP I/O, NOR Flash I/O, N2300 I/O
CMT SDRAM core, optional APE combo SDRAM core
Display (VDD), accelerometer (Vdd), battery cover switch (Vdd)
SIM
Not Used
Back-up Battery
600R/100MHz
VBat4
VAna
2.5V (60mA)
N2200's internal usage, BSI-line pull-up. Line pull-up, HeadDet-line pull-up
600R/100MHz
VBat5
VR1
VRFC
2.5V (15mA)
1.8V (15mA)
Ref. Oscillator, Ref clk buffer, digital blocks of N7500 & N7501, TB clock buffer supply
IO signals powering of RAP (VDDARX & VDDATX), N2200 internal usage (ALS, ADC input pull-up)
VBat6
Vref & ADC
1.09/1.4V
VCOREA reference voltage, BTEMP line pull-up
600R/100MHz
VBatCP
VRCP1
VRCP2
4.75V (5mA)
4.75V (5mA)
VPLUS analogue voltage of N7500
VPLUS analogue voltage of N7501
220R/100MHz
10u
VBatH
H-Bridges
Internal only, no output
N2300
220R/100MHz
22u
10n
22u
VBAT1
VBAT1
VCORE
1.05/1.25/1.35/1.4V (400mA)
RAP core
VCharOut1
VCharOut2
VCharOutK
Charger Control
1u0
VBAT3
VOUT
2.5V (90mA)
To accessory
VCCInt reg for FBUS/USB
600R/100MHz
Camera Vlogic
LP3991TLX -1.8
1.8V (150mA)
Camera Logic power
600R/100MHz
Camera Vanalog
LP39851TLX -2.8
2.8V (150mA)
Camera analogue power
28R/100MHz
HDD Regulator
TPS72501D
3.0V (configurable voltage) (1A)
HDD regulator
4u7
22uH
LED Driver
TPS61061
18.5V (overlimit) 0-20mA (SW controlled)
LED SMPS
600R/100MHz
1u
TLV320AIC33 regulator
LP39851TLX
3.0V (150 mA)
VDAC, TPA4411 audio power amplifier, 'AIC33 DAC.
220R/100MHz
10n
22u
APE regulator
LM3661-1.40V/1.05V
1.40V/1.05V (600mA)
VCOREA, APE power.
Combo Memory
LP3990ITLX-1.8
1.8V (150mA)
VDRAM2, combo memory

Figure 82 Power distribution diagram

Power supply components:

- N2200
- N2300
- N4200 application processor VCORE SMPS
- N5205 - LDO for HDD
- N2101 - LDO for Audio
- N1470 and N1471 - two camera regulators
- N5000 - Combo Memory LDO
- N2301 - backlight SMPS

All the above are powered by the main battery voltage.

The battery voltage is also used on the RF side for power amplifiers (GSM PA & WCDMA PA) and for RF ASICs N7500(Rx) & N7501(Tx).

Discrete power supplies are used to generate 2.8 V to BT, 1.8 V for the camera IO voltage, 2.8 V for the camera analogue voltage, 1.3 V / 1.5 V for the application processor and 18 V for the backlight LEDs.

The device supports both 1.8 V / 3 V SIM cards which are powered by N2200 / VSIM1. USB accessories which needs power from the device are powered by N2300 / VOUT.

Because the LED driver in N2300 is not used, an external SMPS is used instead. The external LED SMPS is still controlled by N2300 and powered by battery voltage.

System power-up

After inserting the main battery, regulators started by HW are enabled. SW checks, if there is some reason to keep the power on. If not, the system is set to power off state by watchdog. Power up can be caused by the following reasons:

- Power key is pressed
- Charger is connected
- RTC alarm occurs
- MBUS wake-up

After that:

- N2200 activates sleep clock and VANA, VDRAM, VIO and VR1 regulators.
- Voltage appearing at N2200's RSTX pin is used for enabling N2300 ASIC.
- N2300 enables VCORE regulator and its internal RC-oscillator (600 kHz).
- VCTCXO regulator is set ON and RF clock (main system clock) is started to produce.
- N2200 will release PURX ~ 16 ms after power up is enabled (the RF clock is then stable enough).
- Synchronizing clock (2.4 MHz) for N2300 is started to be produced. After PURX is released and two rising edges of 2.4 MHz synchronous clock have been detected in the SMPSClk input, N2300 is starting to use that instead of the 600 kHz internal RC-oscillator.
- HW start-up procedure has been finalized and the system is up and running. Now it is possible for SW to switch ON other needed regulators.

Clocking scheme

There are two main clocks in the system: a 38.4 MHz RF clock produced by VCTCXO in the RF section and a 32.768 kHz sleep clock produced by N2200 with an external crystal.

The RF clock is generated only when VCTCXO is powered on by an N2200 regulator. The regulator itself is activated by SleepX signals from both RAP and application processor. When both CPUs are in sleep, the RF clock is stopped.

The RF clock is used by RAP, which provides (divided) a 19.2 MHz SysClk further to the application processor. Both RAP and the application processor have internal PLLs which create clock signals for other peripheral devices/interfaces such as SIM, CCP, I2C and memories.

32k Sleep Clock is always powered on after startup. The Sleep clock is used by RAP and application processor for low-power operation.

SMPS Clk is a 2.4 MHz clock line from RAP to N2300 used for switch mode regulator synchronizing in the active mode. In the deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

LPRF Clk is a 38.4 MHz signal from N7500 ASIC to Bluetooth and WLAN modules.

CLK600 is a 600 kHz signal from N2300 to APE VCORE SMPS. The clock source is an internal RC oscillator in N2300 (during the power-up sequence) or RAP SMPS Clk divided by 4 after the power-up sequence.

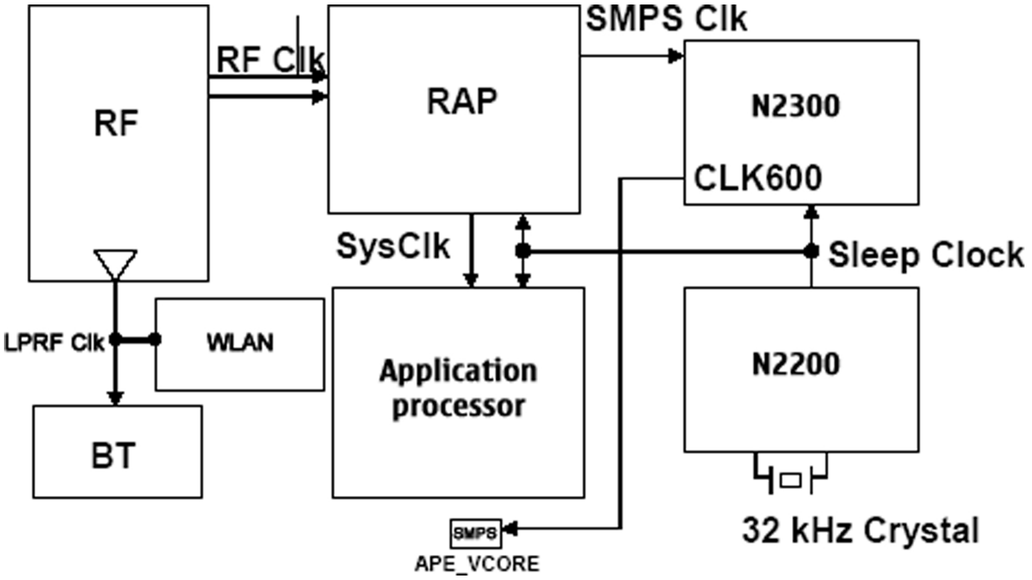


Figure 83 Clocking scheme

BRF6150 Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. Data rate is regulated between the master and the slave.

The device Bluetooth is based on the BRF6150 BT ASIC.

The UART1 interface handles the transfer of control and data information between the application processor and the BT system (BRF6150).

The PCM interface is used for audio data transfer between RAP and the BT system (BRF6150).

WLAN interface

A Wireless Local Area Network (WLAN) is a flexible data communication system in which a mobile user can connect to a local area network through a wireless connection. A standard, which specifies the technologies for WLAN, is called IEEE 802.11.

USB

USB (Universal Serial Bus) provides a wired connectivity between a USB host PC and peripheral devices.

USB is a differential serial bus for USB devices. USB controller (RAP) supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through a mini-USB connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC (N2200), and of an external interface between N2200 and SIM contacts.

The SIM IF is shown in the following figure:

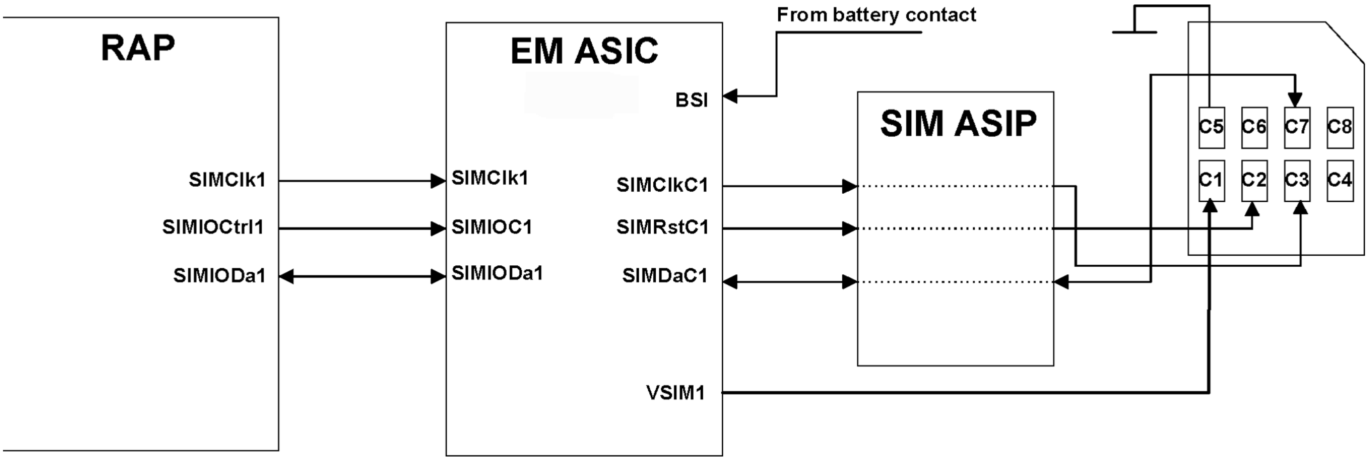


Figure 84 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based in the BSI line. Because of the location of the SIM card, removing the battery causes a quick power down of the SIM IF.

The EM ASIC SIM1 interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

The data communication between the card and the phone is asynchronous half duplex, and the clock supplied to the card is 1-5 MHz, which is 3.2 MHz by default (in GSM system). The data baud rate is the SIM card clock frequency divided by 372 (by default), 64, 32 or 16.

HDD interface

The HDD interface is fully compliant with the Secure Digital Input Output (SDIO) system specification. The HDD is not a removable device. It is connected to the MMC/SDIO2 (1.8 V) interface of the application processor engine (APE). Since the SDIO interface is a 3.0 V interface, voltage level shifters are used to match the signals between the HDD and APE.

The HDD interface is shown in the following illustration:

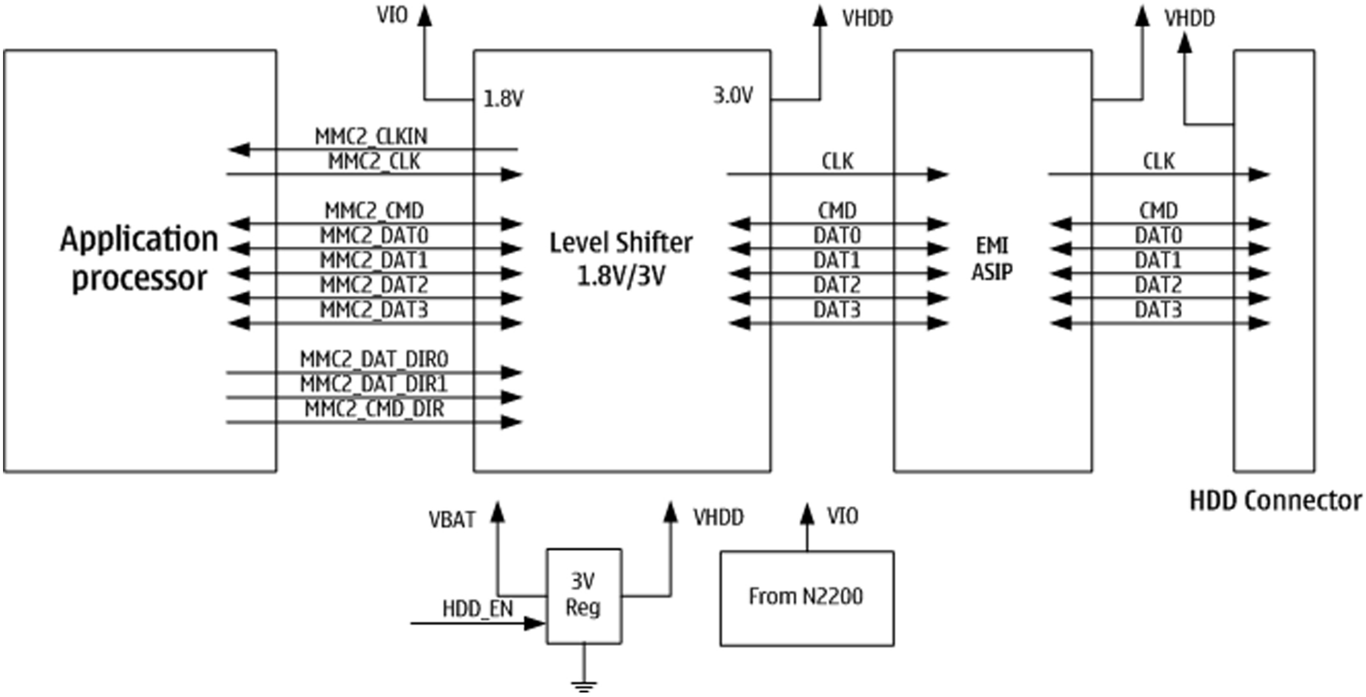

VIO
VHDD
VHDD
1.8V
3.0V
Application processor
MMC2_CLKIN
MMC2_CLK
MMC2_CMD
MMC2_DAT0
MMC2_DAT1
MMC2_DAT2
MMC2_DAT3
MMC2_DAT_DIR0
MMC2_DAT_DIR1
MMC2_CMD_DIR
Level Shifter 1.8V/3V
CLK
CMD
DAT0
DAT1
DAT2
DAT3
EMI ASIP
CLK
CMD
DAT0
DAT1
DAT2
DAT3
HDD Connector
VBAT
VHDD
VIO
HDD_EN
3V Reg
From N2200

Figure 85 HDD interface

The HDD is placed in a metal shield. It has four conductive gaskets, and the PWB has the corresponding grounding pads.

> **Caution:** Battery removal while accessing the HDD may corrupt data. HDD is protected from this condition via a battery cover hall switch. If the battery cover is removed, S/W will execute a safe shutdown procedure for the HDD.

HDD signals

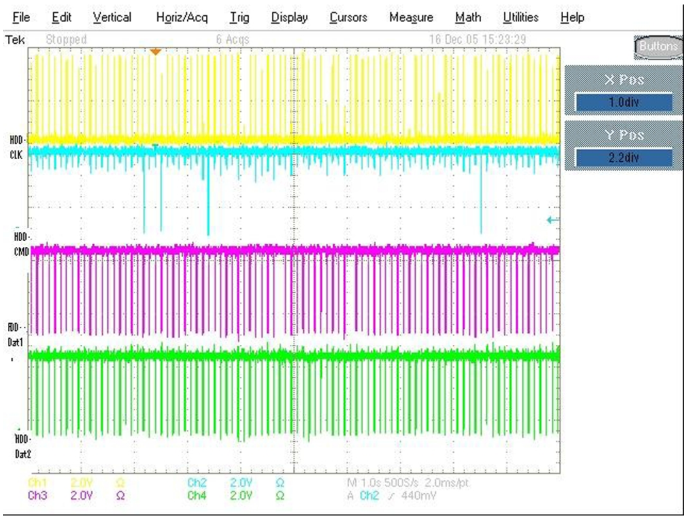

File
Edit
Vertical
Horiz/Acq
Trig
Display
Cursors
Measure
Math
Utilities
Help
Tek
Stopped
6 Acqs
16 Dec 05 15:23:29
Buttons
X Pos
1.0div
Y Pos
2.2div
HDD-CLK
HDD-CMD
HDD-Dat1
HDD-Dat2
Ch1 2.0V Ω
Ch2 2.0V Ω
Ch3 2.0V Ω
Ch4 2.0V Ω
M 1.0s 500S/s 2.0ms/pt
A Ch2 ⁄ 440mV

Figure 86 HDD data transfer

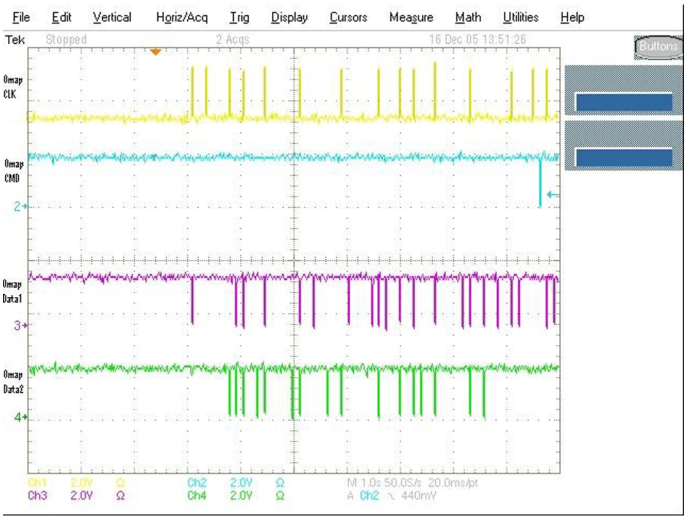

File Edit Vertical Horiz/Acq Trig Display Cursors Measure Math Utilities Help
Tek Stopped 2 Acqs 16 Dec 05 13:51:26
Buttons
Omap CLK
Omap CMD
2
Omap Data1
3
Omap Data2
4
Ch1 2.0V Ω
Ch3 2.0V Ω
Ch2 2.0V Ω
Ch4 2.0V Ω
M 1.0s 50.0S/s 20.0ms/pt
A Ch2 ↘ 440mV

Figure 87 Application processor data transfer

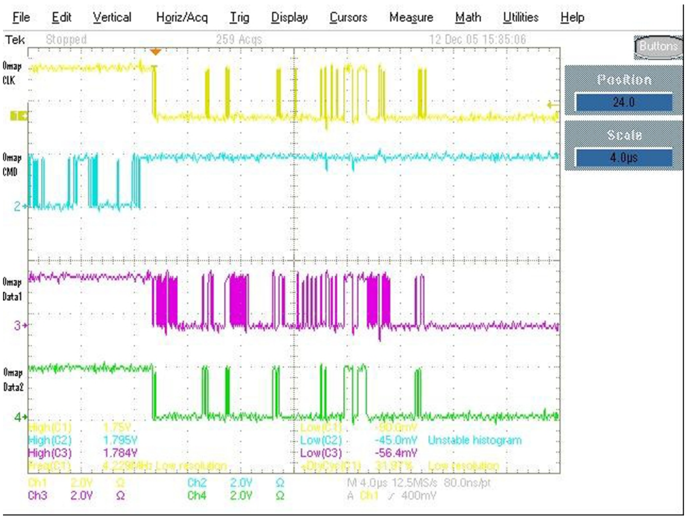

File Edit Vertical Horiz/Acq Trig Display Cursors Measure Math Utilities Help
Tek Stopped 259 Acqs 12 Dec 05 15:35:06
Buttons
Position
24.0
Scale
4.0µs
Omap CLK
Omap CMD
2
Omap Data1
3
Omap Data2
4
High(C1) 1.75V
High(C2) 1.795V
High(C3) 1.784V
Freq(C1) 4.2298MHz Low resolution
Low(C1) -90.0mV
Low(C2) -45.0mV Unstable histogram
Low(C3) -56.4mV
+DtyCyc(C1) 31.97% Low resolution
Ch1 2.0V Ω
Ch3 2.0V Ω
Ch2 2.0V Ω
Ch4 2.0V Ω
M 4.0µs 12.5MS/s 80.0ns/pt
A Ch1 ↗ 400mV

Figure 88 Application processor HDD initialisation

Accelerometer

To protect the HDD in a free fall event, an accelerometer is used. When a free fall is detected, the HDD SW can safely park the HDD heads with the help of the accelerometer.

The accelerometer includes a sensing element, and an IC interface able to take the information from the sensing element and to provide the measured acceleration signals to the external world through an I2C.

The accelerometer interface connections are the following:

- VAUX is used as Vdd supply voltage
- VIO is used as Vdd-IO
- I2C is connected to the APE
- Int/Ready pin is connected to the APE GPIO(33)
- The interrupt is generated, when a free fall is detected.

Battery interface

The battery interface supports a 3-pole battery interface. The interface consists of three connectors: VBAT, BSI and GND.

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

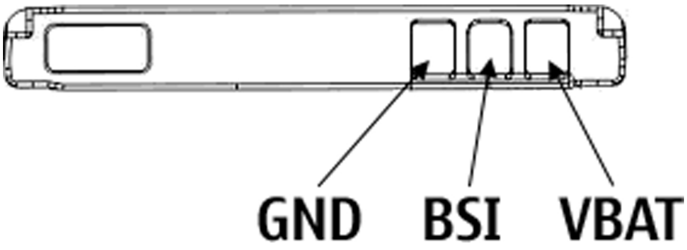


Figure 89 Battery pin order

Battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line, which is located on the transceiver PWB, at a place where the phone temperature is most stable.

For service purposes, the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

Camera interface

The device uses a 2.0 megapixel camera module with a sensor resolution of 1600 x 1200. The following block diagram shows how a CCP bus is used to transfer image data from the camera module to the phone engine. This bi-directional control bus is a software-implemented I2C interface.

The camera regulator N1470 powers the digital parts of the camera, and a camera regulator N1471 is used for powering the analogue parts.

A CAMVCTRL signal (Vctrl) is used for activating the camera module. When the Vctrl signal is Low, the module enters the power on mode. When the signal is High, the module enters the power off mode.

A CAMCLK signal feeds the system clock for the camera module.

User interface

Display interface

Display module mechanical concept

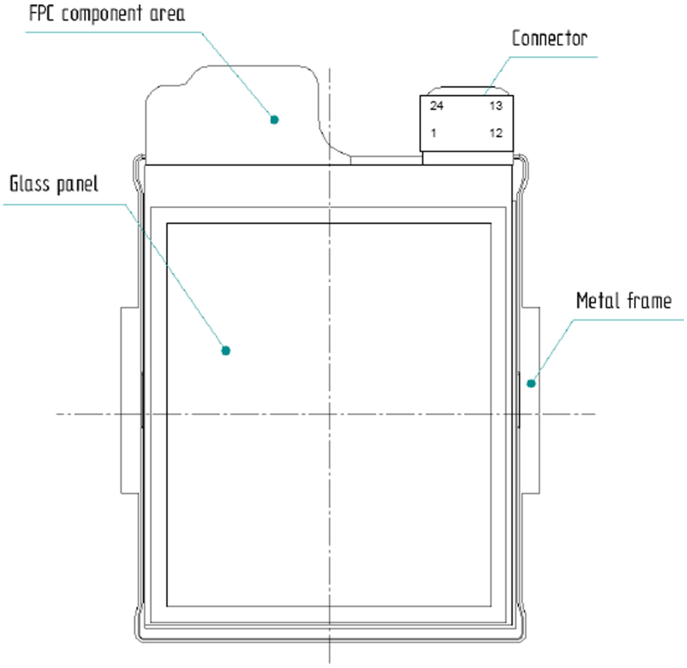


Figure 90 General diagram of the LCD module

Display features:

- 262,144 colours
- Partial display function Power saving by pausing display process on part of the screen.
- Built-in RAM capacity 176 rows x 208 lines x 18 bits = 658,944 bits

The display has two different operating modes:

1. Normal mode, Full screen, 260k colours
2. Partial idle mode, 8 colours and only part of the display is active

The module includes:

- FPWB foil including connector and discretes and driver circuits
- display panel (glass)
- drivers including display controller and 176 x 208 x 18 bits RAM
- backlight system: lightguide, LEDs and necessary optical sheets
- supporting mechanics
- metal frame (stainless steel)
- plastic frame

The interconnection between the LCD module and the Nokia engine is implemented with a 24-pin board-to-board connector.

The display is controlled via a MeSSi-8 interface by the application processor. All MeSSi-8 signals go through the EMC filtering ASIPs.

The display module does not require any tunings in service.

Keyboard

The device ITU keyboard, cancel key and edit key ares on the main PWB. Application, Volume Up & Down are located on the main PWB but on the sides of the device.

Five additional keys are located on the cover slide. These keys are for the music function. The music keys electrical path is via spring contacts under the slide cover. A slider switch, lock key, and a power button are located at the top of the unit. There is also a magnetically controlled hall switch used to indicate the position of the keypad slide cover. The switch, key, and sensor are not part of the keypad matrix.

The keymatrix has seven rows and five columns. The navigation key is connected to the same keymatrix.

Table 21 Keymatrix

Columns						
Rows		0	1	2	3	4
	0	Soft Left	Soft Right	Navigation Left	Navigation Right	Volume Up
	1	Navigation Select	Send	Navigation Up	Navigation Down	Volume Down
	2	7	2	3	8	
	3	5		1	6	
	4	9	*	Next	#	Stop
	5	End		Previous	4	Play/Pause
	6	0	Edit(Pencil)	Clear	Apps	

Rows	4					Access
	5					

Display and keyboard backlight

The device has one LED Driver (SMPS) that is used to drive both display and keyboard LEDs.

Both display LEDs and keyboard LEDs (two 4 piece chains) are connected in series. Another 2 series of LEDs illuminate the Soft and Send/End keys.

The current adjustment of the driver is done from the display LED branch. The keyboard current also depends on the display brightness.

Table 22 LED driver control signals

	From	To	Voltage	Function
PWM	N2300	N2301	PWM 0%-100%, 1.8 V	LED brightness (127 levels)
GenOut3	N2300	V2300	0V / 1.8 V	ITU Keyboard LEDs ON (1.8 V) /OFF (0V)

ASICs

RAP ASIC

RAP ASIC is a 3G Radio Application Processor.

In general RAP consists of three separate parts:

- Processor subsystem (PSS) that includes the main processor and related functions
- MCU peripherals that are mainly controlled by MCU
- DSP peripherals that are mainly controlled by DSP

RAP core voltage (1.4 V) is generated from the EM ASIC (N2300) VCORE and I/O voltage (1.8 V) is from the EM ASIC (N2200) VIO. The core voltage in sleep mode is 1.05 V.

EM ASIC N2200

EM ASIC N2200 includes the following functional blocks:

- Start up logic and reset control
- Charger detection
- Battery voltage monitoring
- 32.768 kHz clock with external crystal
- Real time clock with external backup battery
- SIM card interface
- Stereo audio codecs and amplifiers
- A/D converter
- Regulators
- Vibra interface
- Digital interface (CBUS)

EM ASIC N2300

EM ASIC N2300 includes the following functional blocks:

- Core supply generation
- Charge control circuitry
- Level shifter and regulator for USB/FBUS
- Current gauge for battery current measuring
- External LED driver control interface
- Digital interface (CBUS)
- Accessory supply voltage regulator
- Vout - accessory

Device memories

RAP memories NOR flash and SDRAM

The modem memory consists of 64 Mbit SDRAM and 64 Mbit NOR flash memories.

SDRAM is a dynamic memory for ISA (Intelligent Software Architecture) SW.

NOR is used for ISA SW code and PM data and CDSP (Cellular Digital Signal Processor) SW code.

SDRAM core voltage (1.8 V) is generated from N2200 VDRAM and I/O voltage (1.8 V) is from VIO. NOR flash uses VIO for both core and I/O voltages.

Combo memory

The application memory of the device consists of NAND/DDR combo memory. The stacked DDR/NAND application memory has 512 Mbits of DDR memory and 512 Mbits of flash memory. DDR DRAM memory is stacked above the NAND flash.

The application processor includes a 16-bit dedicated memory interface called External Memory Interface Fast (EMIFF). This is used to support an interface for the DDR memory. The application processor provides also a NAND flash controller located in the shared peripheral bus, providing support for 8-bit NAND flash. The interface requires an 8-bit address bus multiplexed with 8-bit data bus and several control signals.

The core voltage for DDR is 1.8 V, which is generated by discrete LDO. 1.8 V (VIO) is for DDR I/O voltage. Both NAND core and I/O voltages are 1.8 V generated by VIO.

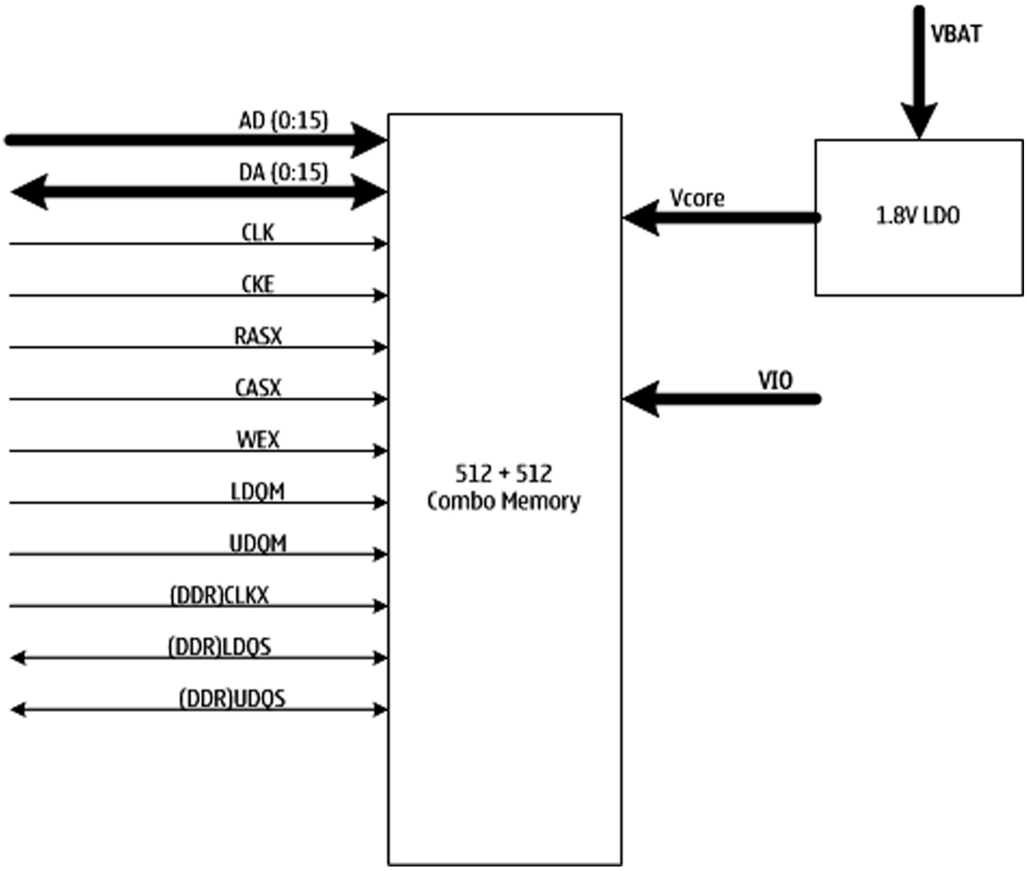

VBAT
AD (0:15)
DA (0:15)
CLK
CKE
RASX
CASX
WEX
LDQM
UDQM
(DDR)CLKX
(DDR)LDQS
(DDR)UDQS
512 + 512
Combo Memory
Vcore
1.8V LDO
VIO

Figure 91 Combo memory block diagram

Table 23 Combo memory interface signals

Signal name	I/O	Description	
AD (0:15)	I	Address inputs	
DA (0:15)	I/O	Data inputs/outputs	
CLK	I	Clock iput	
CKE	I	Clock enable	
RASX	I	Row address strobe	
CASX	I	Column addterr strobe	
WEX	I	Write enable	
LDQM		Lower input data mask	
UDQM		Upper input data mask	
(DDR)CLKX	I	DDR Cliock input	
(DDR)LDQX	I/O	Lower data strobe	
(DDR)UDQX	I/O	Upper data strobe	

Table 24 Supply voltages for combo memory interfaces

Parameter	Symbol	min	max	unit	note
Supply voltage	VBAT			V	Battery voltage
Combo memory core voltage	Vore	1.65	1.95	V	Nominal 1.8V s
Host I/O supply voltage1.8V	VIO	1.71	1.89	V	Nominal 1.8V

Audio concept

Audio HW architecture

The device has two audio architectures: music playback through the headset and the telephony path.

The functional core of the audio hardware is built around two ASICs: RAP CMT engine ASIC and the mixed-signal ASIC N2200.

N2200 provides an interface for the transducers and the accessory connector. Because audio amplifiers are also integrated into N2200, the only discrete electronics components needed for audio paths are audio filtering components and EMC/ESD components.

An audio DAC, N2100, and an audio amp, N2000, are used to supply Hi-fidelity audio signals to the external headphone.

There are three audio transducers:

- 8 mm dynamic earpiece
- 11 x 15 mm dynamic speaker
- microphone module

In addition to the audio transducers, N2200 also provides an output for the dynamic vibra component.

All galvanic audio accessories are connected to the 3.5 mm audio accessory connector.

A Bluetooth audio module that is connected to RAP supports Bluetooth audio functionality.

There is a separate application ASIC for Symbian applications.

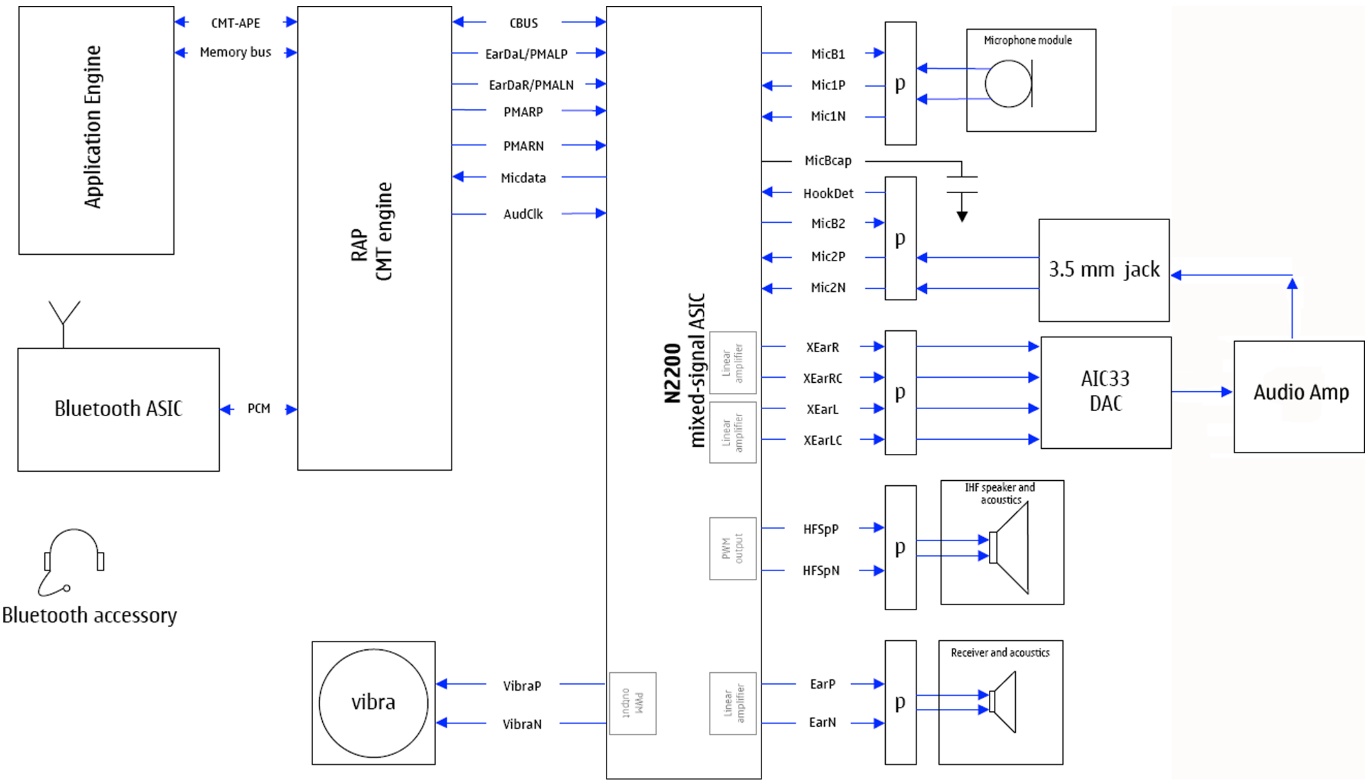

Application Engine
CMT-APE
Memory bus
RAP
CMT engine
CBUS
EarDaL/PMALP
EarDaR/PMALN
PMARP
PMARN
Micdata
AudClk
N2200
mixed-signal ASIC
Linear amplifier
Linear amplifier
PWM output
PWM output
Linear amplifier
MicB1
Mic1P
Mic1N
MicBcap
HookDet
MicB2
Mic2P
Mic2N
XEarR
XEarRC
XEarL
XEarLC
HFSpP
HFSpN
EarP
EarN
p
Microphone module
3.5 mm jack
AIC33
DAC
Audio Amp
IHF speaker and acoustics
Receiver and acoustics
Bluetooth ASIC
PCM
Bluetooth accessory
vibra
VibraP
VibraN

Figure 92 Audio block diagram

Internal microphone

The internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

An analogue electret microphone is connected to the EM ASIC (N2200) Mic1P and Mic1N inputs via asymmetric electrical connection.

The microphone is biased by the N2200 ASIC MicB1 bias voltage output.

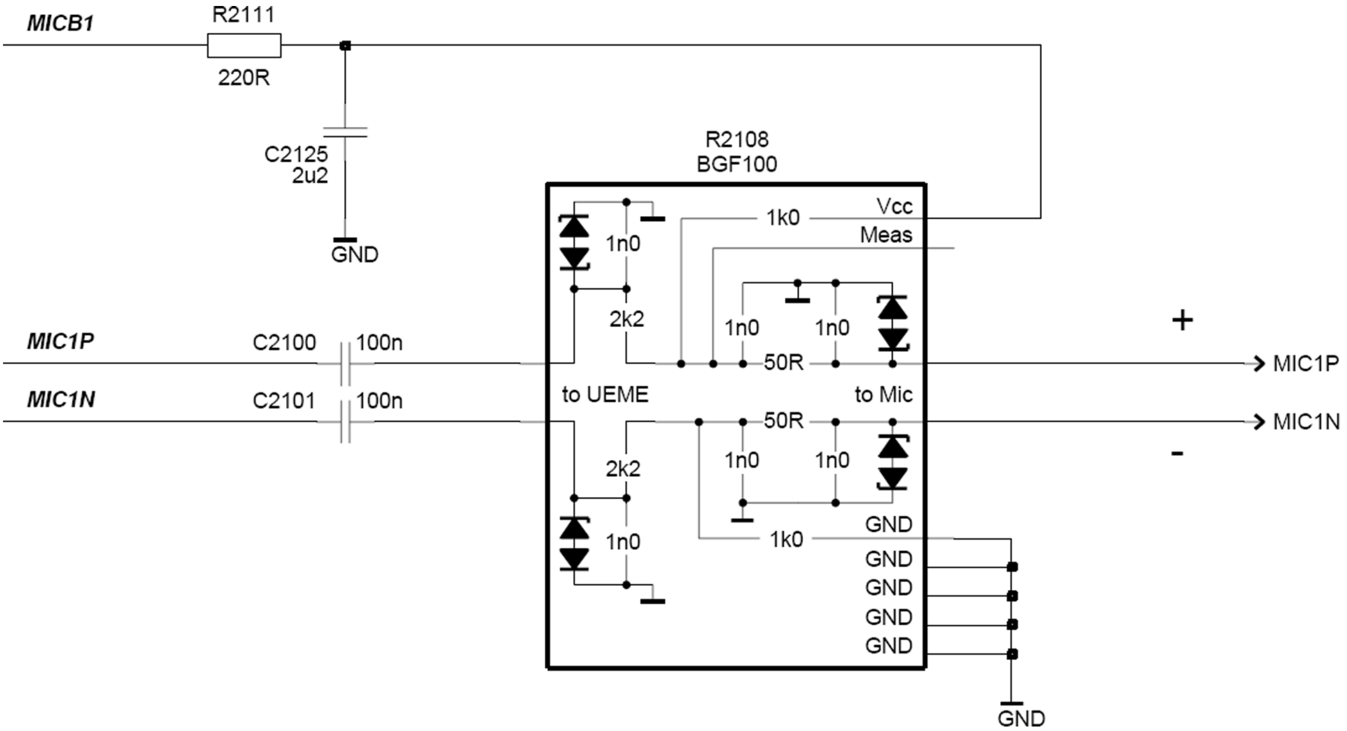

MICB1
R2111
220R
C2125
2u2
GND
R2108
BGF100
1k0
Vcc
Meas
1n0
2k2
1n0
1n0
50R
MIC1P
C2100
100n
MIC1N
C2101
100n
to UEME
to Mic
50R
2k2
1n0
1n0
1n0
1k0
GND
GND
GND
GND
GND
GND
+
MIC1P
MIC1N
-

Figure 93 Internal microphone circuitry

External microphone

Galvanic accessories are connected to the system connector (3.5 mm jack).

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

The external microphone circuitry is biased by the N2200 ASIC MicB2 bias voltage output. The circuitry provides a symmetrical connection for the microphone from the 3.5 mm connections, XMICN and XMICP, to the N2200 ASIC inputs, Mic2P and Mic2N.

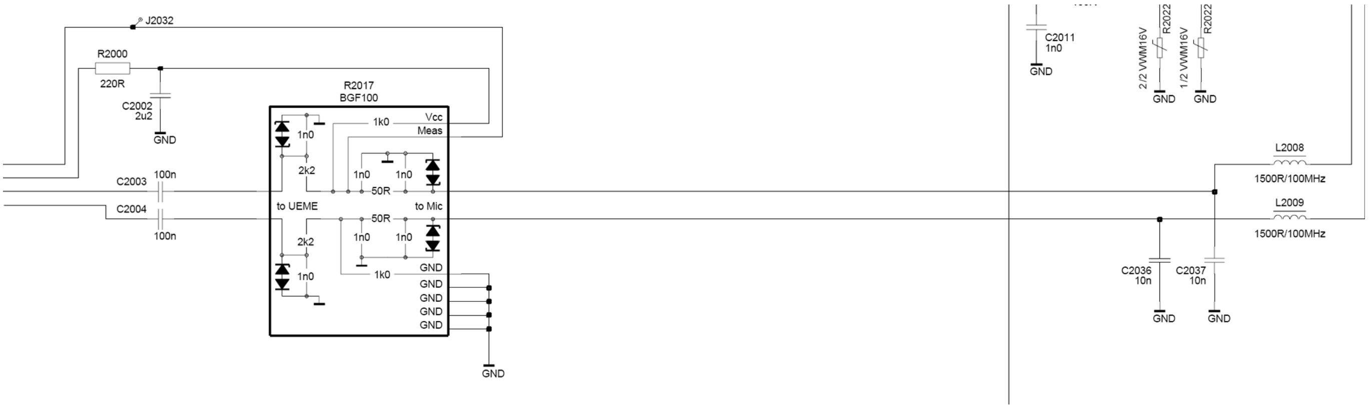

J2032
R2000
220R
C2002
2u2
GND
C2003
100n
C2004
100n
R2017
BGF100
1k0
Vcc
Meas
1n0
2k2
1n0
1n0
50R
to UEME
to Mic
50R
2k2
1n0
1n0
1n0
1k0
GND
GND
GND
GND
GND
GND
C2011
1n0
GND
2/2 VWM16V
R2022
1/2 VWM16V
R2022
GND
GND
L2008
1500R/100MHz
L2009
1500R/100MHz
C2036
10n
C2037
10n
GND
GND

Figure 94 External microphone circuitry

Internal earpiece

The internal earpiece is used in the HandPortable (HP) call mode. A dynamic 8 mm earpiece capsule is connected to N2200 differential outputs EarP and EarN.

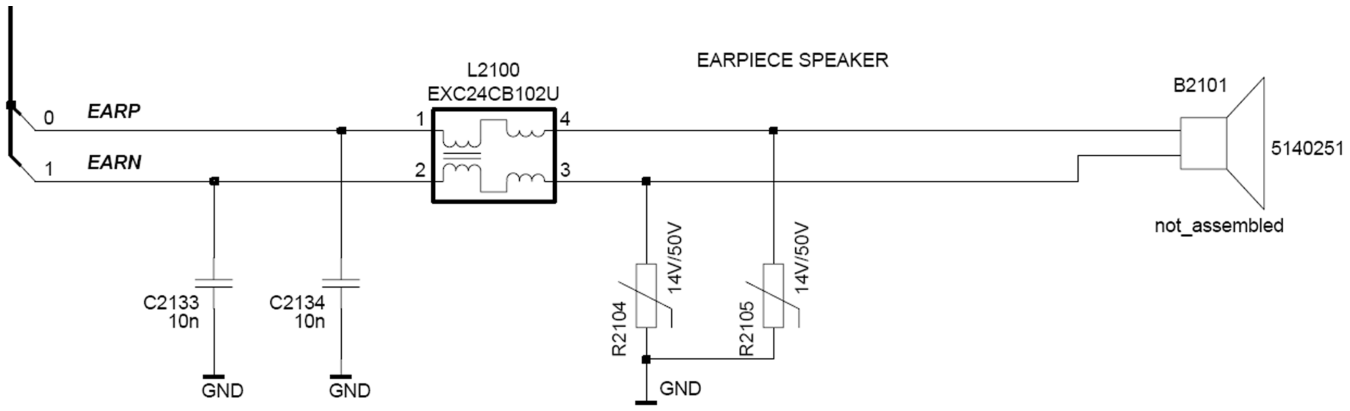

EARPIECE SPEAKER
L2100
EXC24CB102U
0 EARP
1 EARN
1
2
4
3
B2101
5140251
not_assembled
C2133
10n
C2134
10n
GND
GND
R2104
14V/50V
R2105
14V/50V
GND

Figure 95 Internal earpiece circuitry

Internal speaker

The internal speaker is used in Internal HandsFree (IHF) call mode.

A dynamic 11 x 15 mm (rectangular) speaker is connected to the N2200 ASIC outputs HFSpP and HFSpN.

The IHF amplifier integrated in N2200 is a Digital Pulse Modulated Amplifier (DPMA).

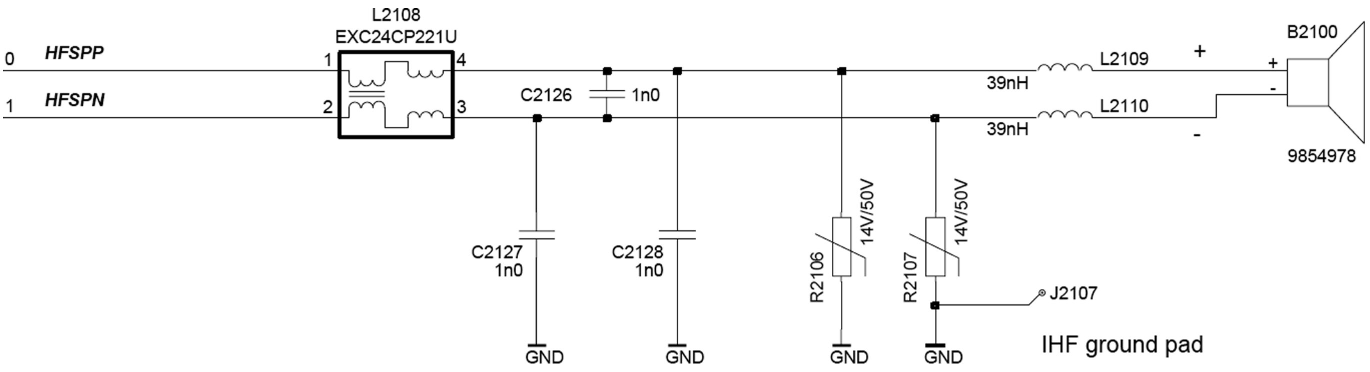

L2108
EXC24CP221U
0 HFSPP
1 HFSPN
1
2
4
3
C2126
1n0
39nH
L2109
39nH
L2110
+
-
B2100
+
-
9854978
C2127
1n0
C2128
1n0
R2106
14V/50V
R2107
14V/50V
J2107
IHF ground pad
GND
GND
GND
GND

Figure 96 Internal speaker circuitry

External earpiece

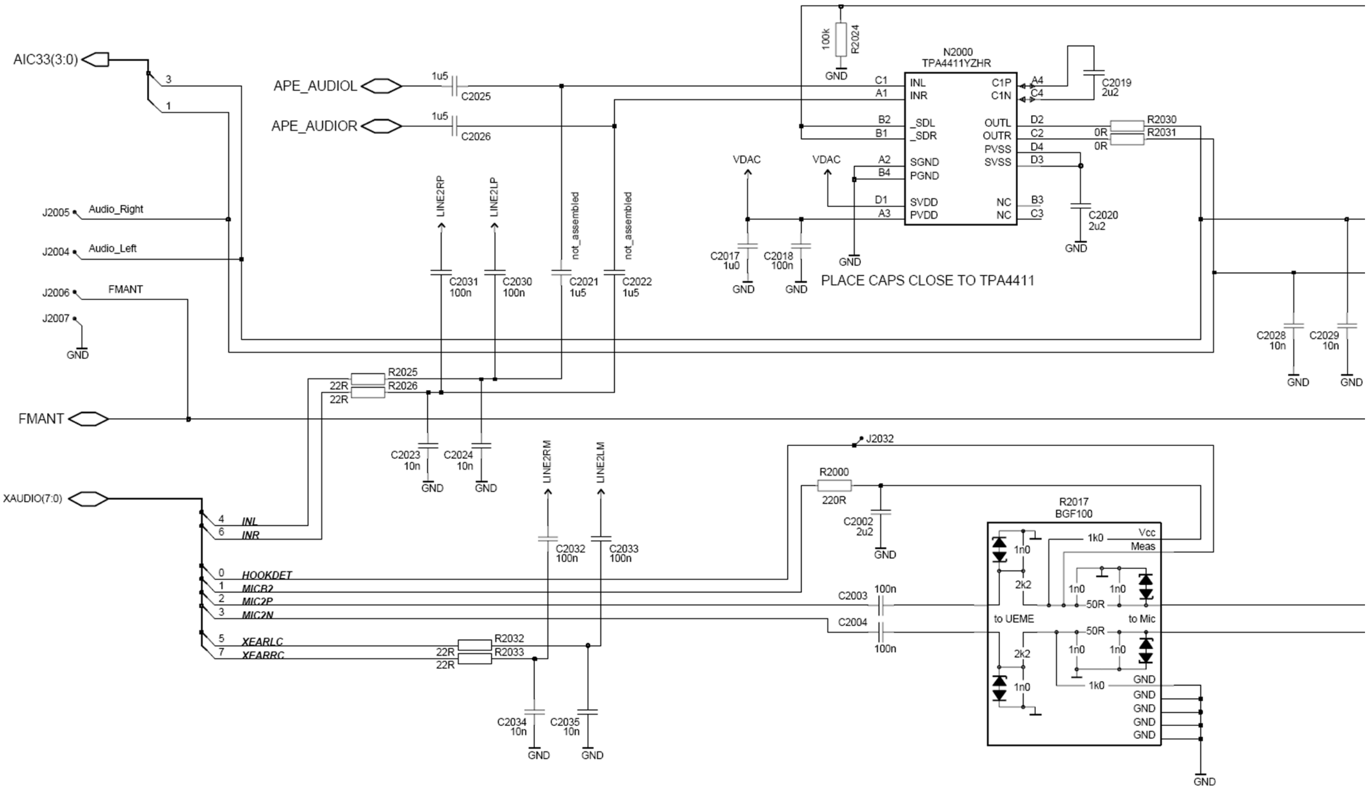
All galvanic accessories are connected to the system connector (3.5 mm jack).

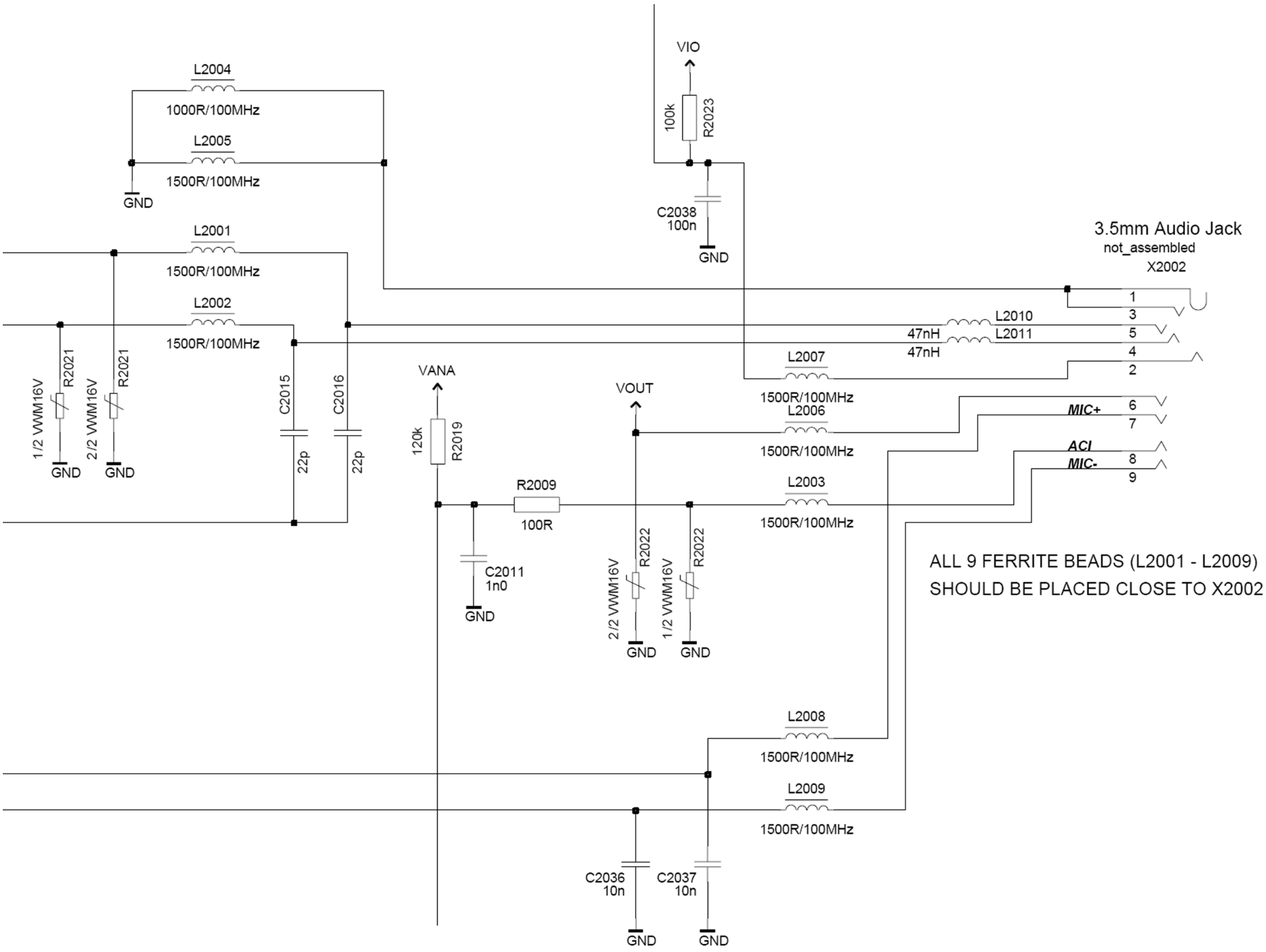
The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

The EM ASIC (N2200) provides two output channels in either single-ended or differential format. N2200 outputs XearL and XearLC form the left channel audio output, and XearR and XearRC the right channel audio output. The XearR output is directed to the AIC33 input. RAP controls the AIC33, and directs the operation of the AIC33 (which line input and output characteristics).

On the system connector side, HSEAR P and HSEAR N form the left channel output, and HSEAR R P and HSEAR R N the right channel output. Respectively, HSEAR N and HSEAR R N are the ground pins if the output works in a single-ended operation.

External earpiece circuitry (3.5 mm connector on the right)


AIC33(3:0)
3
1
APE_AUDIOL
APE_AUDIOR
1u5
C2025
1u5
C2026
J2005
Audio_Right
J2004
Audio_Left
J2006
FMANT
J2007
GND
LINE2RP
LINE2LP
not_assembled
not_assembled
C2031
100n
C2030
100n
C2021
1u5
C2022
1u5
R2025
R2026
22R
22R
FMANT
C2023
10n
C2024
10n
GND
GND
XAUDIO(7:0)
4 INL
6 INR
0 HOOKDET
1 MICB2
2 MIC2P
3 MIC2N
5 XEARLC
7 XEARRC
LINE2RM
LINE2LM
C2032
100n
C2033
100n
R2032
R2033
22R
22R
C2034
10n
C2035
10n
GND
GND
100k
R2024
GND
N2000
TPA4411YZHR
C1
A1
B2
B1
A2
B4
D1
A3
INL
INR
_SDL
_SDR
SGND
PGND
SVDD
PVDD
C1P
C1N
OUTL
OUTR
PVSS
SVSS
NC
NC
A4
C4
D2
C2
D4
D3
B3
C3
C2019
2u2
R2030
R2031
0R
0R
C2020
2u2
GND
VDAC
VDAC
C2017
1u0
C2018
100n
GND
GND
GND
PLACE CAPS CLOSE TO TPA4411
C2028
10n
C2029
10n
GND
GND
J2032
R2000
220R
C2002
2u2
GND
C2003
100n
C2004
100n
R2017
BGF100
Vcc
Meas
1k0
1n0
2k2
1n0
1n0
50R
to UEME
to Mic
50R
2k2
1n0
1n0
1n0
1k0
GND
GND
GND
GND
GND
GND


L2004
1000R/100MHz
L2005
1500R/100MHz
GND
L2001
1500R/100MHz
L2002
1500R/100MHz
1/2 VWM16V
R2021
2/2 VWM16V
R2021
GND
GND
C2015
22p
C2016
22p
VIO
100k
R2023
C2038
100n
GND
3.5mm Audio Jack
not_assembled
X2002
1
3
5
4
2
6
7
8
9
L2010
L2011
47nH
47nH
L2007
1500R/100MHz
L2006
1500R/100MHz
L2003
1500R/100MHz
MIC+
ACI
MIC-
VANA
120k
R2019
VOUT
R2009
100R
C2011
1n0
GND
2/2 VWM16V
R2022
1/2 VWM16V
R2022
GND
GND
ALL 9 FERRITE BEADS (L2001 - L2009)
SHOULD BE PLACED CLOSE TO X2002
L2008
1500R/100MHz
L2009
1500R/100MHz
C2036
10n
C2037
10n
GND
GND

Vibra circuitry

The vibra circuitry is used for the vibra-alarm function.

The vibra motor is connected to the EM ASIC (N2200) VibraP and VibraN Pulse Width Modulated (PWM) outputs.

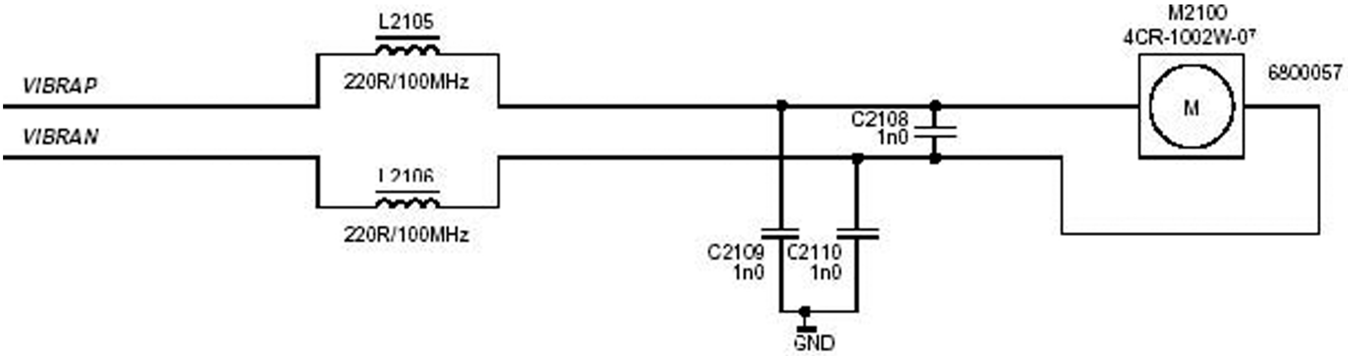

L2105
220R/100MHz
VIBRAP
VIBRAN
L2106
220R/100MHz
M2100
4CR-1002W-07
6800057
M
C2108
1n0
C2109
1n0
C2110
1n0
GND

Figure 97 Vibra circuitry

3.5 mm audio data combo jack

The 3.5 mm jack can accommodate a standard 3.5 Audio plug as well as a 3.5 Plug with data wing. The “wing” provides connections for the microphone and remote control functions on the headset. Components are fixed to the transceiver mechanics by two location bosses on the side of the housing body. Proper mounting is essential to ensure that all spring contacts are contacting the PWB during use.

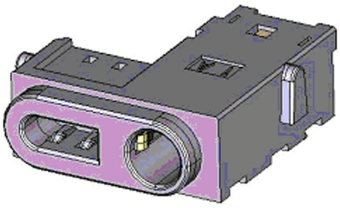


Figure 98 View of 3.5 mm audio data combo jack

Table 25 3.5 mm 4-pole audio jack connections

Pin	Signal	I/O	Engine connection		Notes
1	Vcom	<-	Audio Amp	HPCOM	Common return for both channels.
2	Jack Detect	->	RAP	GenIO48	Signal pulls to GND when a plug is inserted into the jack.
3	Vcom	<-	Audio Amp	NC	No Connection
4	XearR	<-	Audio Amp	HPROUT	Audio output, right channel, positive
5	XearL	<-	Audio Amp	HPLOUT	Audio output, left channel, positive node
6	Vout	->	N2300	Vout	output supply for ACI
7	Mic+	<-	N2200	Mic2P	External Mic input, positive
8	ACI	->	N2200	HeadDet	Accessory detection and identification signal input
9	Mic-	<-	N2200	Mic2N	External Mic input, negative

Baseband technical specifications

External interfaces

External interfaces

Name of Connection	Connector reference
USB	X2001
Charger	X2000
SIM	X2700
Battery connector	X2070

ACI interface electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Accessory detection						
Headset detection threshold		1.75	1.9	2.05	V	N2200 specific
Headset detection hysteresis			25		mV	
Headset detection pull ups		1	2	4	uA	
After Mbus is switched to HeadDet						
High-level input voltage.	V_{IH}	1.9 x V_{DDS}	2.5/2.98	3.0	V	N2200 specific
Low-level input voltage	V_{IL}	0	0.2	0.7 x V_{DDS}	V	
High-level output voltage	V_{OH}	2.4	2.5	2.6	V	
Low-level output voltage	V_{OL}	0		0.3	V	
Rise/fall time	tR/tF			12.5	ns	

VOUT electrical characteristics

Description	Parameter	Min	Max	Typical	Unit	Notes
Vout regulator for external accessories	VOUT	2.43	2.57	2.5	V	Max load 90mA

USB IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Absolute maximum voltage on D+ and D-	$V_{D+/D-}$	-1	4.6	V	USB specification revision 2.0

Description	Parameter	Min	Max	Unit	Notes
Supply voltage	VBUS	4.4	5.25	V	
Supply current:					
Functioning	I_{VBUS}		100	mA	
Suspended	I_{VBUS}		500	uA	
Unconfigured	I_{VBUS}		100	mA	
High-level input voltage:				V	
High (driven)	V_{IH}	2			
High (floating)	V_{IHZ}	2.7	3.6		
Low-level input voltage	V_{IL}		0.8	V	
Differential input sensitivity	V_{DI}	0.2		V	|(D+) - (D-)|
Differential input voltage range	V_{CM}	0.8	2.5	V	Included VDI range
Low-level output voltage	V_{OL}	0	0.3	V	
High-level output voltage (driven)	V_{OH}	2.8	3.6	V	
Output signal crossover voltage	V_{CRS}	1.3	2	V	

FBUS interface electrical characteristics (between RAP and N2300)

Description	Parameter	Min	Max	Unit
High-level input voltage	V_{IH}	0.7 x V_{DDSHV2}	V_{DDSHV2}	V
Low-level Input voltage	V_{IL}	0	0.3 x V_{DDSHV2}	V
High-level output voltage	V_{OH}	0.8 x V_{DDSHV2}	V_{DDSHV2}	V
Low-level output voltage	V_{OL}	0	0.22 x V_{DDSHV2}	V
Rise/fall time	tR/tF	0	25	ns
(VDDSHV2 = 1.8V)				

Headset hook detection interface (XMICN) electrical characteristics

Description	Min	Typ	Max	Unit	Notes
Hook detection threshold 1	1.25	1.35	1.45	V	Two fixed thresholds inside N2200. Selectable by SW
Hook detection threshold 2	0.5	0.6	0.7	V	
Hook detection hysteresis		25		mV	
Hook detection pull ups	1	2	4	uA	

Audio signal electrical characteristics

Description	Parameter	Typ	Unit	Notes
XMIC N	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
XMIC P	Audio in	1	V_{pp}	DC Offset 2.5-2.78V
HSEAR N	Audio out	1	V_{pp}	10Ω nominal serial impedance
HSEAR P	Audio out	1	V_{pp}	10Ω nominal serial impedance
HSEAR R N	Audio out	1	V_{pp}	10Ω nominal serial impedance
				Not connected in mono
HSEAR R P	Audio out	1	V_{pp}	10Ω nominal serial impedance
				Not connected in mono

SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	VSIM	Out	N2200	VSIM1	Supply voltage to SIM card, 1.8 V or 3.0 V.
C2	SIMRST	Out	N2200	SIM1Rst	Reset signal to SIM card
C3	SIMCLK	Out	N2200	SIM1ClkC	Clock signal to SIM card
C5	GND	-	GND		Ground

Pin	Signal	I/O	Engine connection		Notes
C7	SIMDATA	In/Out	N2200	SIM1DaC	Data input / output

Charger connector and charging interface connections & electrical characteristics

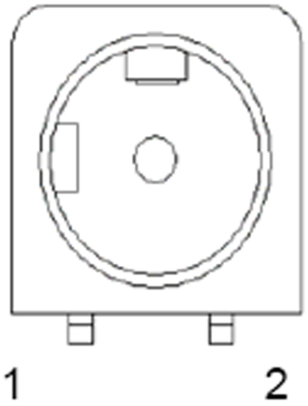


Figure 99 Charger connector

Table 26 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	N2300	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 27 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	9	V	Center pin
Vchar	I Charge		0.85	A	Center pin
Charge GND			0.85	A	
Threshold for charging, rising (N2300)	V_{MSTR+}	2.1		V	Typical value
Threshold for charging, falling (N2300)	V_{MSTR-}	1.9		V	Typical value

Battery connector and interface connections & electrical characteristics

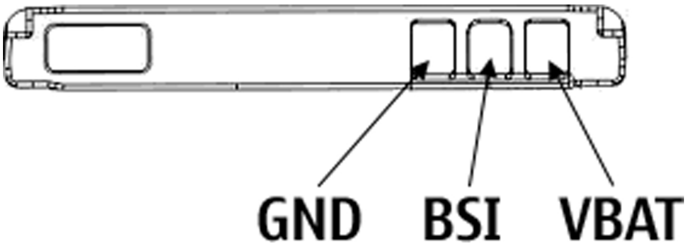


Figure 100 Battery connector

Table 28 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)
3	GND		GND		Ground

Table 29 Battery IF electrical characteristics

Description	Parameter	Max	Unit
Operation voltage	V_{IN}	4.23	VDC
Current rating	I_{IN}	0.9	A

WLAN interface signals

Note: The signal direction is seen from the direction of the WLAN system.

Signal name	I/O	From / to	Function
RF - Air			
ANT	I/O	WLAN antenna	WLAN antenna port, 50 W
Power			
VBAT	In	Battery	Phone battery voltage
VIO	In	EM ASIC	I/O-voltage, 1.8V
Clocking			
REF_CLK	In	RF	System clock, 38.4 MHz
SleepClk	In	EM ASIC	Sleep clock, 32.768 kHz
WLAN_CLK_REQ	Out	RAP ASIC	Clock request signal
Control			

Signal name	I/O	From / to	Function
WLAN_ENA/ WLAN_RESETX	In	Application processor	WLAN enable/reset
WLAN_IRQ	Out	Application processor	WLAN interrupt request
SPI			
SPI_CLK	In	Application processor	SPI clock
SPI_DIN	In	Application processor	SPI data in
SPI_DOUT	Out	Application processor	SPI data out
SPI_CSX	In	Application processor	SPI chip select

Internal interfaces

Internal interfaces

Name of Connection	Connector reference
Slider pogo pinsr	X4402, X4403
Display	X4401
Camera	X1470
Vibra	M2100
Microphone	X4402
Earpiece	B2101
IHF speaker	B2102
HDD	X5200

UI module connector and IF connections

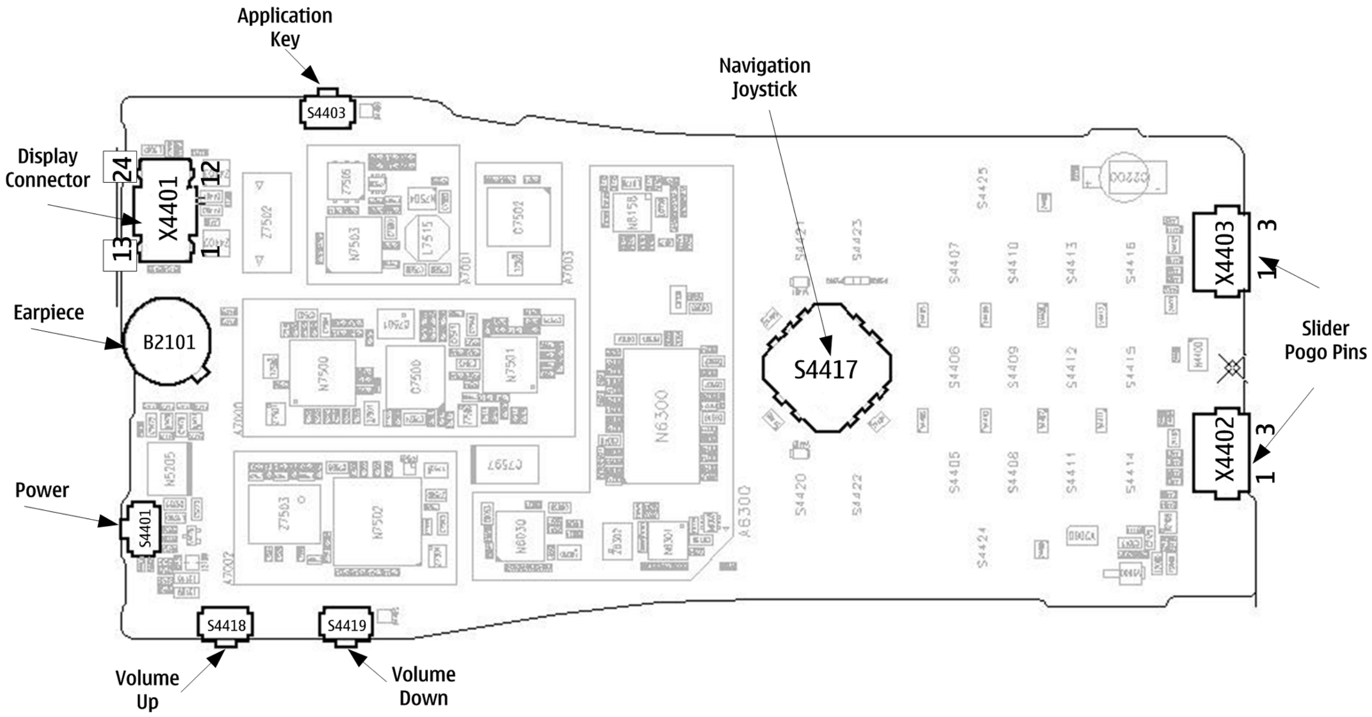

Application Key
S4403
Navigation Joystick
Display Connector
X4401
24
12
13
1
Earpiece
B2101
S4417
X4403
3
1
Slider Pogo Pins
X4402
3
1
Power
S4401
N6300
S4418
S4419
Volume Up
Volume Down

Figure 101 UI components

Table 30 Slider pogo pins

Pin	Signal	I/O	Engine Connection	
1 of X4402	mic1p	<-	Retu	MIC1P
2 of X4402	mic1n	<-	Retu	MIC1N
3 of X4402	col4	<-	Application processor	KBC4
1 of X4403	row5	->	Application processor	KBR5
2 of X4403	row4	->	Application processor	KBR4
3 of X4403	col2	<-	Application processor	KBC2

Keyboard interface electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
High-level input voltage	V_{IH}	0.65* V_{DDS}	V_{DDS}	0.3+ V_{DDS}	V	Row
Low-level input voltage	V_{IL}	-0.3	0	0.35* V_{DDS}	V	Row

Description	Parameter	Min	Typ	Max	Unit	Notes
High-level output voltage	V_{OH}	1.62	V_{DDS}	1.98	V	Column
Low-level output voltage	V_{OL}		0	0.45	V	Column
(VDDS = 1.8V)						

Display interface connections

Pin	Signal	I/O	Engine connection		Notes
1	GND				
2	WRX	->	Application processor	Lcdwrx	Write Enable (active low)
3	GND				
4	D0	<->	Application processor	Lcdda0	Data
5	D1	<->	Application processor	Lcdda1	Data
6	D2	<->	Application processor	Lcdda2	Data
7	D3	<->	Application processor	Lcdda3	Data
8	GND				
9	VDDI	<-	N2200	VIO	Interface voltage
10	VDD	<-	N2200	VAUX	Core voltage
11	GND				
12	LEDin	<-	N2301	VLEDOUT	N2301 is controlled by N2300 with 68 Ohm series resistor.
13	LEDout	->	R2304	SETCURR_LCD	Sink resistor
14	GND				
15	CSX				Hard ground
16	D/CX	<-	Application processor	Lcdcmd	Data/ Command select (high=data, low =command)

Pin	Signal	I/O	Engine connection		Notes
17	GND				
18	D7	<->	Application processor	Lcdda7	Data
19	D6	<->	Application processor	Lcdda6	Data
20	D5	<->	Application processor	Lcdda5	Data
21	D4	<->	Application processor	Lcdda4	Data
22	TE	->	Application processor	Te	Tearing Effect
23	RDX	<-	Application processor	Lcdrdx	Read Enable (active low)
24	RESX	<-	Application processor	Gpio_60	Reset (active low)

Camera interface connections and electrical characteristics

Table 31 Camera interface connections

Pin	Signal	I/O	Engine connection		Notes
1	GND				
2	SDA	<->	D4800	sda	I2C serial control bus data
3	D+	->	D4800	Ccpdap	Differential serial data, positive node
4	SCL	<-	D4800	scl	I2C serial control bus clock
5	D-	->	D4800	Ccpdan	Differential serial data, negative node
6	CAMCLK	<-	D4800	ExtClk	System clock for camera module
7	VDDI	<-	N1470 1.8V regulator	VOUT	Camera Digital Voltage
8	GND				
9	CLK+	->	D4800	Ccpclkp	Differential serial clock, positive node
10	CAMVCTRL	<-	D4800	VCtrl	Camera module activating signal
11	CLK-	->	D4800	Ccpclkn	Differential serial clock, negative node
12	VDD	<-	N1471 2.8V Regulator	VOUT	Camera analogue Voltage
13	Strobe	->			No Connect. Signal Unused.
14	GND				

Table 32 Camera CCP IF electrical characteristics

Description	Parameter	Min	Typ	Max	Unit	Notes
Common mode voltage	VCMF	0.7	0.75	0.85	V	-1
Differential voltage swing	VOD	130	185	250	mV	-2
Operating frequency	fCLK	120		160	MHz	SW controls frequency
Differential rise and fall time		300		800	ps	-3

Note:

- Common mode voltage is a mean value of high and low states of one single-ended signal.
- Differential voltage swing is differential amplitude between signals of differential pair.
- Differential transitions should be only measured with good equipment (bandwidth > 1 GHz), otherwise results will seem too slow.

Table 33 Camera supply voltage characteristics

Description	Parameter	Min	Typ	Max	Unit
Camera analogue voltage	VDD	2.65	2.78	2.91	V
Camera digital voltage	VDDI	1.7	1.8	1.91	V

Table 34 Camera control IF electrical characteristics

Description	Parameter	Min	Typ.	Max	Unit	Notes
SDA, SCL, Vctrl, ExtClk	VIH	1.5	1.8	VDD	V	High-level input voltage
SDA, SCL, Vctrl, ExtClk	VIL	0	-	0.54	V	Low-level input voltage
SDA	VOL	0	-	0.4	V	High-level output voltage
Regulator Enable	VOH	1.35	1.8	2.3V	V	D4800 GPIO High-level output voltage
Cam_strobe	VOH	0.8 x VDD	-	VDD		High-level output voltage
Cam_strobe	VOL	0	-	0.4	V	Low-level output voltage
ExtClk	fExtClk		9.6		MHz	SW controls frequency
SDA, SCL	tR			300	ns	Rise time

HDD interface connection and electrical characteristics

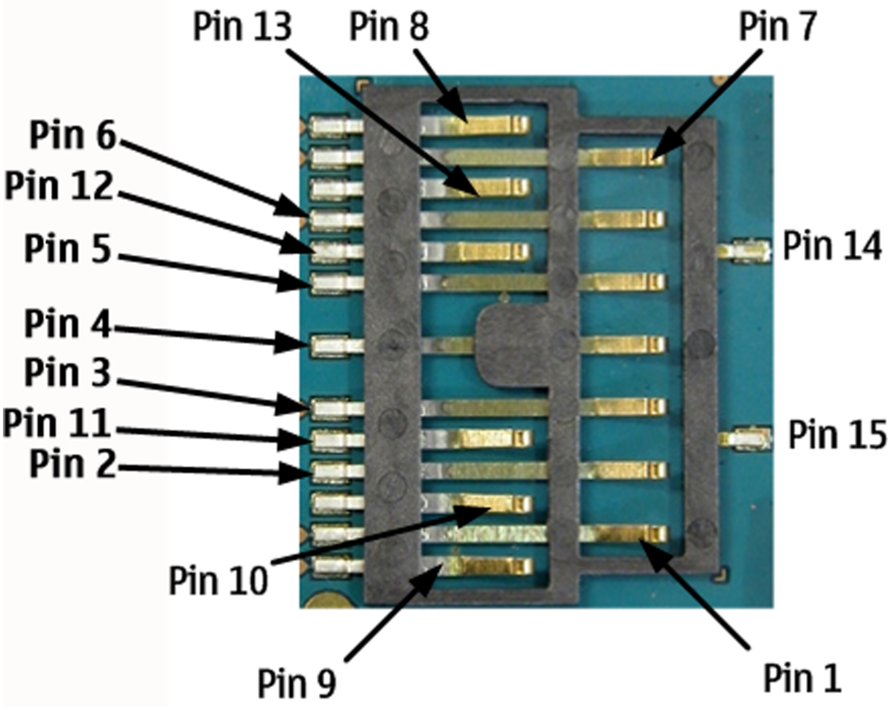

Pin 13
Pin 8
Pin 7
Pin 6
Pin 12
Pin 5
Pin 14
Pin 4
Pin 3
Pin 11
Pin 2
Pin 15
Pin 10
Pin 9
Pin 1

Figure 102 HDD interface connector

Table 35 HDD interface connections

Pin	Signal	I/O	Engine Connection		Notes
1	DAT0	<->	Application Processor	MMC_DAT0	DATA
2	GND				
3	CLK	-<	Application Processor	MMC2_CLK	Clock
4	VHDD	<-	N5205	OUT	3.0V Regulator
5	GND				
6	CMD	<->	Application Processor	MMC2_CMD	Command
7	DAT3	<->	Application Processor	MMC2_DAT3	DATA
8	DAT2	<->	Application Processor	MMC2_DAT2	DATA
9	DAT1	<->	Application Processor	MMC2_DAT1	DATA
10	GND				
11	GND				
12	NC				
13	NC				

Pin	Signal	I/O	Engine Connection		Notes
14	GND				
15	GND				

Table 36 HDD interface connections electrical specifications

Description	Parameter	Min	Typ.	Max	Unit	Notes
CLK	fCLK	100		400	kHz	Identification Mode
CLK	fCLK	0	12	25	MHz	Data Transfer Mode
VIO	vIO	1.7	1.8	1.89	V	
VHDD	vHDD	2.895	3.0	3.105	V	

Back-up battery interface connections and electrical characteristics

Table 37 Back-up battery connections

Pin name	I/O	Connection	Notes
L2207, VBack	->	N2200, VBack	Back-up battery G2200 is connected to N2200 via coil

Table 38 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

RF description

Receiver

Introduction to receiver functionality

Receiver functions are implemented in an RF ASIC.

The receiver is a linear direct conversion receiver consisting of separate front ends (LNA (Low Noise Amplifier) and demodulator) for each supported system. After the demodulators, the signal paths are combined to one common BB path.

WCDMA receiver functionality

In the WCDMA mode, the received signal is fed from the antenna to a duplex filter. After the duplex filter the signal goes via a balun to an LNA (Low Noise Amplifier) residing in N7500. From the LNA, the signal goes through a band pass filter.

After filtering, the signal goes to the down conversion mixer, which converts the signal to baseband I and Q signals. At the BB frequency the signal is amplified, and fed to a low pass filter. The Rx channel filter must be calibrated with an automatic routine whenever the Rx ASIC IC is changed to a phone.

In the WCDMA mode, the corner frequency of the filter is set to approximately 2.1 MHz. The filter is followed by an AGC (Automatic Gain Control) amplifier with an adjustable gain. The signal is further amplified before it is fed to balanced analogue IQ output pins. The analogue output pins are accompanied by reference voltage output, which sets the DC level for the AD converter in the BB ASIC RAP.

The last stage of the RF Rx chain is an output buffer which feeds the signal and a reference voltage (VREFCM) to the BB ASIC.

GSM receiver functionality

As GSM Rx branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the antenna switch module.

The antenna switch module is followed by integrated LNAs residing in the Rx ASIC.

The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

After the down conversion mixer, the Rx chain is similar to the WCDMA Rx. The channel select filter is set to 115 kHz in the GSM mode.

Transmitter

Introduction to transmitter functionality

Transmitter functions are implemented in an RF ASIC. The ASIC contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use.

In addition, the ASIC contains separate RF paths comprising a final frequency IQ modulator and VGA amplifiers.

WCDMA transmitter functionality

In the transmitter side, an analogue I/Q modulated signal is received from digital baseband into an RF ASIC and fed through a low pass filter. After the filter the signal is fed to the IQ modulator, which converts the signal to final Tx frequency. There are two separate I/Q modulators: one for WCDMA and another for GSM signals. The signal then exits the RF ASIC via a balanced line. Next, the signal is band pass filtered by a SAW filter before it is fed to the WCDMA PA module. After the PA, the transmitted WCDMA signal is fed through an isolator and a duplex filter to the antenna.

WCDMA power control

WCDMA Tx power control is accomplished by the two VGA amplifier stages in the Tx ASIC.

The VGAs have a common temperature compensation circuit and one voltage mode analogue input for gain control (TXC).

Another function of the detector voltage is to steer the DC/DC converter, which is providing a variable supply voltage for the WCDMA PA.

WCDMA PA module

The WCDMA PA is housed in a separate module having:

- a variable supply voltage input for the amplifier stages (Vcc11),
- a battery supply voltage for the bias circuits (Vcc12),
- and two bias current inputs.

Bias currents are generated by 5-bit DA converters in the RF ASIC.

If a different manufacturer's PA is changed to the phone, this setting must be set again.

PA DC/DC converter

The control of the DC/DC converter is fed back from the power detector circuit.

GSM transmitter functionality

An RF ASIC receives an analogue IQ modulated signal from digital BB, which is first low pass filtered with filter corner frequency set to approximately 200 kHz. After the filter, the signal is routed to the GSM modulator.

After the VGA stage the signal exits the RF ASIC. In case of GSM1800/1900 the signal goes directly to the GSM PA module. In case of EGSM900 (and GSM850), the PA module is preceded by a SAW filter. After the filter, the signal is fed to the GSM PA module. Finally, the signal is routed via the antenna switch to the antenna.

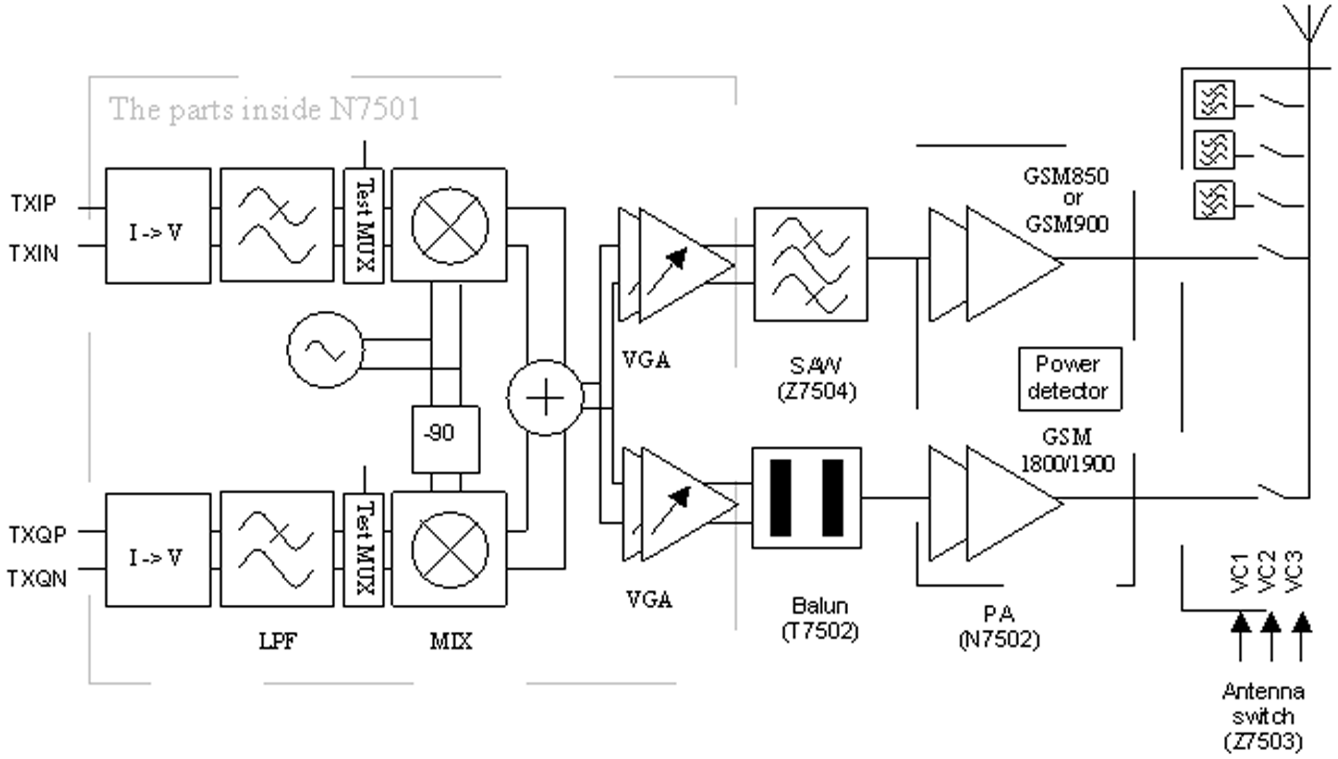

The parts inside N7501
TXIP
TXIN
TXQP
TXQN
I -> V
I -> V
Test MUX
Test MUX
-90
LPF
MIX
VGA
VGA
SAW
(Z7504)
Balun
(T7502)
GSM850
or
GSM900
Power
detector
GSM
1800/1900
PA
(N7502)
VC1
VC2
VC3
Antenna
switch
(Z7503)

Figure 103 GSM transmitter

GSM power control

A closed control loop comprise an integrated power detector (in PA module) and an error amplifier. The error amplifier resides in N7501, and it controls the transmitter power of GSM.

GSM PA module

A single GSM/EDGE PA module contains two separate amplifier chains, one for EGSM900 (and GSM850) and another for GSM1800/1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

RF has separate synthesizers for Rx and Tx. Both synthesizers consist of:

- PLL (Phase-Locked Loop)
- loop filter
- VCO (Voltage Controlled Oscillator)
- balun

The VCO frequencies are locked by PLLs into a reference oscillator, VCTCXO (Voltage Controlled Temperature Compensated Crystal Oscillator).

The PLLs are located in RF ASICs and controlled via RFBus.

The VCOs operate at the channel frequency multiplied by two in the upper bands and by four in EGSM900 (and GSM850, if applicable). The required frequency dividers required for modulators and demodulators are integrated into RF ASICs. The dividers are controlled via RFBus.

Reference oscillators

A 38.4MHz VCTCXO is used as a reference oscillator for the frequency synthesizers.

Regulators

RF ASICs contain integrated regulators to supply regulated voltages for their internal circuitry and other RF parts. Rx VCO supply is got via a switch from an RF ASIC VR1 regulator.

Frequency mappings

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

WCDMA 2100 Rx frequencies

Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX
10562	2112.4	4224.8	10625	2125	4250	10688	2137.6	4275.2	10751	2150.2	4300.4	10814	2162.8	4325.6
10563	2112.6	4225.2	10626	2125.2	4250.4	10689	2137.8	4275.6	10752	2150.4	4300.8	10815	2163	4326
10564	2112.8	4225.6	10627	2125.4	4250.8	10690	2138	4276	10753	2150.6	4301.2	10816	2163.2	4326.4
10565	2113	4226	10628	2125.6	4251.2	10691	2138.2	4276.4	10754	2150.8	4301.6	10817	2163.4	4326.8
10566	2113.2	4226.4	10629	2125.8	4251.6	10692	2138.4	4276.8	10755	2151	4302	10818	2163.6	4327.2
10567	2113.4	4226.8	10630	2126	4252	10693	2138.6	4277.2	10756	2151.2	4302.4	10819	2163.8	4327.6
10568	2113.6	4227.2	10631	2126.2	4252.4	10694	2138.8	4277.6	10757	2151.4	4302.8	10820	2164	4328
10569	2113.8	4227.6	10632	2126.4	4252.8	10695	2139	4278	10758	2151.6	4303.2	10821	2164.2	4328.4
10570	2114	4228	10633	2126.6	4253.2	10696	2139.2	4278.4	10759	2151.8	4303.6	10822	2164.4	4328.8
10571	2114.2	4228.4	10634	2126.8	4253.6	10697	2139.4	4278.8	10760	2152	4304	10823	2164.6	4329.2
10572	2114.4	4228.8	10635	2127	4254	10698	2139.6	4279.2	10761	2152.2	4304.4	10824	2164.8	4329.6
10573	2114.6	4229.2	10636	2127.2	4254.4	10699	2139.8	4279.6	10762	2152.4	4304.8	10825	2165	4330
10574	2114.8	4229.6	10637	2127.4	4254.8	10700	2140	4280	10763	2152.6	4305.2	10826	2165.2	4330.4
10575	2115	4230	10638	2127.6	4255.2	10701	2140.2	4280.4	10764	2152.8	4305.6	10827	2165.4	4330.8
10576	2115.2	4230.4	10639	2127.8	4255.6	10702	2140.4	4280.8	10765	2153	4306	10828	2165.6	4331.2
10577	2115.4	4230.8	10640	2128	4256	10703	2140.6	4281.2	10766	2153.2	4306.4	10829	2165.8	4331.6
10578	2115.6	4231.2	10641	2128.2	4256.4	10704	2140.8	4281.6	10767	2153.4	4306.8	10830	2166	4332
10579	2115.8	4231.6	10642	2128.4	4256.8	10705	2141	4282	10768	2153.6	4307.2	10831	2166.2	4332.4
10580	2116	4232	10643	2128.6	4257.2	10706	2141.2	4282.4	10769	2153.8	4307.6	10832	2166.4	4332.8
10581	2116.2	4232.4	10644	2128.8	4257.6	10707	2141.4	4282.8	10770	2154	4308	10833	2166.6	4333.2
10582	2116.4	4232.8	10645	2129	4258	10708	2141.6	4283.2	10771	2154.2	4308.4	10834	2166.8	4333.6
10583	2116.6	4233.2	10646	2129.2	4258.4	10709	2141.8	4283.6	10772	2154.4	4308.8	10835	2167	4334
10584	2116.8	4233.6	10647	2129.4	4258.8	10710	2142	4284	10773	2154.6	4309.2	10836	2167.2	4334.4
10585	2117	4234	10648	2129.6	4259.2	10711	2142.2	4284.4	10774	2154.8	4309.6	10837	2167.4	4334.8
10586	2117.2	4234.4	10649	2129.8	4259.6	10712	2142.4	4284.8	10775	2155	4310	10838	2167.6	4335.2
10587	2117.4	4234.8	10650	2130	4260	10713	2142.6	4285.2	10776	2155.2	4310.4			
10588	2117.6	4235.2	10651	2130.2	4260.4	10714	2142.8	4285.6	10777	2155.4	4310.8			
10589	2117.8	4235.6	10652	2130.4	4260.8	10715	2143	4286	10778	2155.6	4311.2			
10590	2118	4236	10653	2130.6	4261.2	10716	2143.2	4286.4	10779	2155.8	4311.6			
10591	2118.2	4236.4	10654	2130.8	4261.6	10717	2143.4	4286.8	10780	2156	4312			
10592	2118.4	4236.8	10655	2131	4262	10718	2143.6	4287.2	10781	2156.2	4312.4			
10593	2118.6	4237.2	10656	2131.2	4262.4	10719	2143.8	4287.6	10782	2156.4	4312.8			
10594	2118.8	4237.6	10657	2131.4	4262.8	10720	2144	4288	10783	2156.6	4313.2			
10595	2119	4238	10658	2131.6	4263.2	10721	2144.2	4288.4	10784	2156.8	4313.6			
10596	2119.2	4238.4	10659	2131.8	4263.6	10722	2144.4	4288.8	10785	2157	4314			
10597	2119.4	4238.8	10660	2132	4264	10723	2144.6	4289.2	10786	2157.2	4314.4			
10598	2119.6	4239.2	10661	2132.2	4264.4	10724	2144.8	4289.6	10787	2157.4	4314.8			
10599	2119.8	4239.6	10662	2132.4	4264.8	10725	2145	4290	10788	2157.6	4315.2			
10600	2120	4240	10663	2132.6	4265.2	10726	2145.2	4290.4	10789	2157.8	4315.6			
10601	2120.2	4240.4	10664	2132.8	4265.6	10727	2145.4	4290.8	10790	2158	4316			
10602	2120.4	4240.8	10665	2133	4266	10728	2145.6	4291.2	10791	2158.2	4316.4			
10603	2120.6	4241.2	10666	2133.2	4266.4	10729	2145.8	4291.6	10792	2158.4	4316.8			
10604	2120.8	4241.6	10667	2133.4	4266.8	10730	2146	4292	10793	2158.6	4317.2			
10605	2121	4242	10668	2133.6	4267.2	10731	2146.2	4292.4	10794	2158.8	4317.6			
10606	2121.2	4242.4	10669	2133.8	4267.6	10732	2146.4	4292.8	10795	2159	4318			
10607	2121.4	4242.8	10670	2134	4268	10733	2146.6	4293.2	10796	2159.2	4318.4			
10608	2121.6	4243.2	10671	2134.2	4268.4	10734	2146.8	4293.6	10797	2159.4	4318.8			
10609	2121.8	4243.6	10672	2134.4	4268.8	10735	2147	4294	10798	2159.6	4319.2			
10610	2122	4244	10673	2134.6	4269.2	10736	2147.2	4294.4	10799	2159.8	4319.6			
10611	2122.2	4244.4	10674	2134.8	4269.6	10737	2147.4	4294.8	10800	2160	4320			
10612	2122.4	4244.8	10675	2135	4270	10738	2147.6	4295.2	10801	2160.2	4320.4			
10613	2122.6	4245.2	10676	2135.2	4270.4	10739	2147.8	4295.6	10802	2160.4	4320.8			
10614	2122.8	4245.6	10677	2135.4	4270.8	10740	2148	4296	10803	2160.6	4321.2			
10615	2123	4246	10678	2135.6	4271.2	10741	2148.2	4296.4	10804	2160.8	4321.6			
10616	2123.2	4246.4	10679	2135.8	4271.6	10742	2148.4	4296.8	10805	2161	4322			
10617	2123.4	4246.8	10680	2136	4272	10743	2148.6	4297.2	10806	2161.2	4322.4			
10618	2123.6	4247.2	10681	2136.2	4272.4	10744	2148.8	4297.6	10807	2161.4	4322.8			
10619	2123.8	4247.6	10682	2136.4	4272.8	10745	2149	4298	10808	2161.6	4323.2			
10620	2124	4248	10683	2136.6	4273.2	10746	2149.2	4298.4	10809	2161.8	4323.6			
10621	2124.2	4248.4	10684	2136.8	4273.6	10747	2149.4	4298.8	10810	2162	4324			
10622	2124.4	4248.8	10685	2137	4274	10748	2149.6	4299.2	10811	2162.2	4324.4			
10623	2124.6	4249.2	10686	2137.2	4274.4	10749	2149.8	4299.6	10812	2162.4	4324.8			
10624	2124.8	4249.6	10687	2137.4	4274.8	10750	2150	4300	10813	2162.6	4325.2			

WCDMA 2100 Tx frequencies

Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx
9612	1922.4	3844.8	9671	1934.2	3868.4	9730	1946	3892	9789	1957.8	3915.6	9848	1969.6	3939.2
9613	1922.6	3845.2	9672	1934.4	3868.8	9731	1946.2	3892.4	9790	1958	3916	9849	1969.8	3939.6
9614	1922.8	3845.6	9673	1934.6	3869.2	9732	1946.4	3892.8	9791	1958.2	3916.4	9850	1970	3940
9615	1923	3846	9674	1934.8	3869.6	9733	1946.6	3893.2	9792	1958.4	3916.8	9851	1970.2	3940.4
9616	1923.2	3846.4	9675	1935	3870	9734	1946.8	3893.6	9793	1958.6	3917.2	9852	1970.4	3940.8
9617	1923.4	3846.8	9676	1935.2	3870.4	9735	1947	3894	9794	1958.8	3917.6	9853	1970.6	3941.2
9618	1923.6	3847.2	9677	1935.4	3870.8	9736	1947.2	3894.4	9795	1959	3918	9854	1970.8	3941.6
9619	1923.8	3847.6	9678	1935.6	3871.2	9737	1947.4	3894.8	9796	1959.2	3918.4	9855	1971	3942
9620	1924	3848	9679	1935.8	3871.6	9738	1947.6	3895.2	9797	1959.4	3918.8	9856	1971.2	3942.4
9621	1924.2	3848.4	9680	1936	3872	9739	1947.8	3895.6	9798	1959.6	3919.2	9857	1971.4	3942.8
9622	1924.4	3848.8	9681	1936.2	3872.4	9740	1948	3896	9799	1959.8	3919.6	9858	1971.6	3943.2
9623	1924.6	3849.2	9682	1936.4	3872.8	9741	1948.2	3896.4	9800	1960	3920	9859	1971.8	3943.6
9624	1924.8	3849.6	9683	1936.6	3873.2	9742	1948.4	3896.8	9801	1960.2	3920.4	9860	1972	3944
9625	1925	3850	9684	1936.8	3873.6	9743	1948.6	3897.2	9802	1960.4	3920.8	9861	1972.2	3944.4
9626	1925.2	3850.4	9685	1937	3874	9744	1948.8	3897.6	9803	1960.6	3921.2	9862	1972.4	3944.8
9627	1925.4	3850.8	9686	1937.2	3874.4	9745	1949	3898	9804	1960.8	3921.6	9863	1972.6	3945.2
9628	1925.6	3851.2	9687	1937.4	3874.8	9746	1949.2	3898.4	9805	1961	3922	9864	1972.8	3945.6
9629	1925.8	3851.6	9688	1937.6	3875.2	9747	1949.4	3898.8	9806	1961.2	3922.4	9865	1973	3946
9630	1926	3852	9689	1937.8	3875.6	9748	1949.6	3899.2	9807	1961.4	3922.8	9866	1973.2	3946.4
9631	1926.2	3852.4	9690	1938	3876	9749	1949.8	3899.6	9808	1961.6	3923.2	9867	1973.4	3946.8
9632	1926.4	3852.8	9691	1938.2	3876.4	9750	1950	3900	9809	1961.8	3923.6	9868	1973.6	3947.2
9633	1926.6	3853.2	9692	1938.4	3876.8	9751	1950.2	3900.4	9810	1962	3924	9869	1973.8	3947.6
9634	1926.8	3853.6	9693	1938.6	3877.2	9752	1950.4	3900.8	9811	1962.2	3924.4	9870	1974	3948
9635	1927	3854	9694	1938.8	3877.6	9753	1950.6	3901.2	9812	1962.4	3924.8	9871	1974.2	3948.4
9636	1927.2	3854.4	9695	1939	3878	9754	1950.8	3901.6	9813	1962.6	3925.2	9872	1974.4	3948.8
9637	1927.4	3854.8	9696	1939.2	3878.4	9755	1951	3902	9814	1962.8	3925.6	9873	1974.6	3949.2
9638	1927.6	3855.2	9697	1939.4	3878.8	9756	1951.2	3902.4	9815	1963	3926	9874	1974.8	3949.6
9639	1927.8	3855.6	9698	1939.6	3879.2	9757	1951.4	3902.8	9816	1963.2	3926.4	9875	1975	3950
9640	1928	3856	9699	1939.8	3879.6	9758	1951.6	3903.2	9817	1963.4	3926.8	9876	1975.2	3950.4
9641	1928.2	3856.4	9700	1940	3880	9759	1951.8	3903.6	9818	1963.6	3927.2	9877	1975.4	3950.8
9642	1928.4	3856.8	9701	1940.2	3880.4	9760	1952	3904	9819	1963.8	3927.6	9878	1975.6	3951.2
9643	1928.6	3857.2	9702	1940.4	3880.8	9761	1952.2	3904.4	9820	1964	3928	9879	1975.8	3951.6
9644	1928.8	3857.6	9703	1940.6	3881.2	9762	1952.4	3904.8	9821	1964.2	3928.4	9880	1976	3952
9645	1929	3858	9704	1940.8	3881.6	9763	1952.6	3905.2	9822	1964.4	3928.8	9881	1976.2	3952.4
9646	1929.2	3858.4	9705	1941	3882	9764	1952.8	3905.6	9823	1964.6	3929.2	9882	1976.4	3952.8
9647	1929.4	3858.8	9706	1941.2	3882.4	9765	1953	3906	9824	1964.8	3929.6	9883	1976.6	3953.2
9648	1929.6	3859.2	9707	1941.4	3882.8	9766	1953.2	3906.4	9825	1965	3930	9884	1976.8	3953.6
9649	1929.8	3859.6	9708	1941.6	3883.2	9767	1953.4	3906.8	9826	1965.2	3930.4	9885	1977	3954
9650	1930	3860	9709	1941.8	3883.6	9768	1953.6	3907.2	9827	1965.4	3930.8	9886	1977.2	3954.4
9651	1930.2	3860.4	9710	1942	3884	9769	1953.8	3907.6	9828	1965.6	3931.2	9887	1977.4	3954.8
9652	1930.4	3860.8	9711	1942.2	3884.4	9770	1954	3908	9829	1965.8	3931.6	9888	1977.6	3955.2
9653	1930.6	3861.2	9712	1942.4	3884.8	9771	1954.2	3908.4	9830	1966	3932			
9654	1930.8	3861.6	9713	1942.6	3885.2	9772	1954.4	3908.8	9831	1966.2	3932.4			
9655	1931	3862	9714	1942.8	3885.6	9773	1954.6	3909.2	9832	1966.4	3932.8			
9656	1931.2	3862.4	9715	1943	3886	9774	1954.8	3909.6	9833	1966.6	3933.2			
9657	1931.4	3862.8	9716	1943.2	3886.4	9775	1955	3910	9834	1966.8	3933.6			
9658	1931.6	3863.2	9717	1943.4	3886.8	9776	1955.2	3910.4	9835	1967	3934			
9659	1931.8	3863.6	9718	1943.6	3887.2	9777	1955.4	3910.8	9836	1967.2	3934.4			
9660	1932	3864	9719	1943.8	3887.6	9778	1955.6	3911.2	9837	1967.4	3934.8			
9661	1932.2	3864.4	9720	1944	3888	9779	1955.8	3911.6	9838	1967.6	3935.2			
9662	1932.4	3864.8	9721	1944.2	3888.4	9780	1956	3912	9839	1967.8	3935.6			
9663	1932.6	3865.2	9722	1944.4	3888.8	9781	1956.2	3912.4	9840	1968	3936			
9664	1932.8	3865.6	9723	1944.6	3889.2	9782	1956.4	3912.8	9841	1968.2	3936.4			
9665	1933	3866	9724	1944.8	3889.6	9783	1956.6	3913.2	9842	1968.4	3936.8			
9666	1933.2	3866.4	9725	1945	3890	9784	1956.8	3913.6	9843	1968.6	3937.2			
9667	1933.4	3866.8	9726	1945.2	3890.4	9785	1957	3914	9844	1968.8	3937.6			
9668	1933.6	3867.2	9727	1945.4	3890.8	9786	1957.2	3914.4	9845	1969	3938			
9669	1933.8	3867.6	9728	1945.6	3891.2	9787	1957.4	3914.8	9846	1969.2	3938.4			
9670	1934	3868	9729	1945.8	3891.6	9788	1957.6	3915.2	9847	1969.4	3938.8			

10 — Schematics

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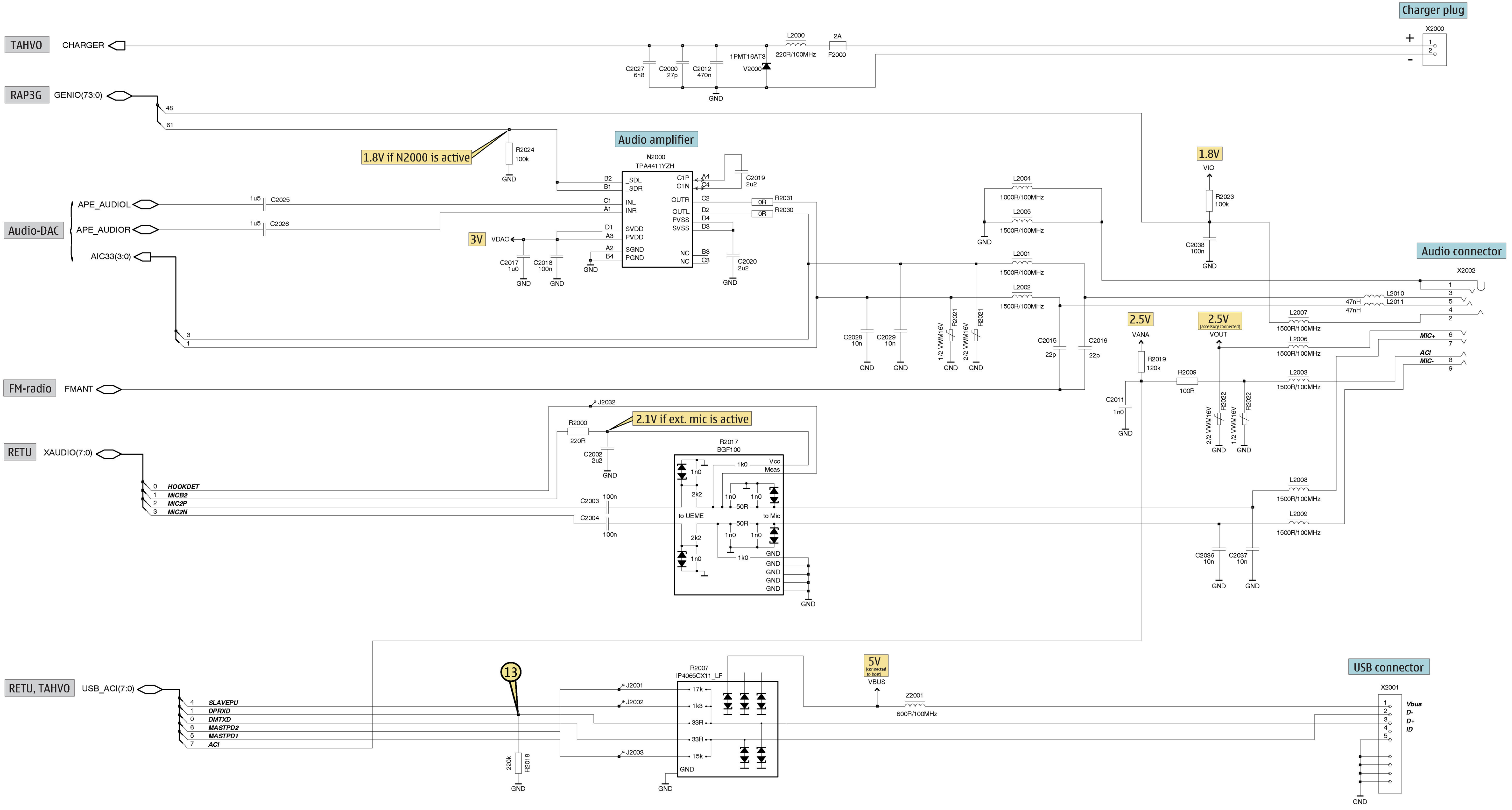
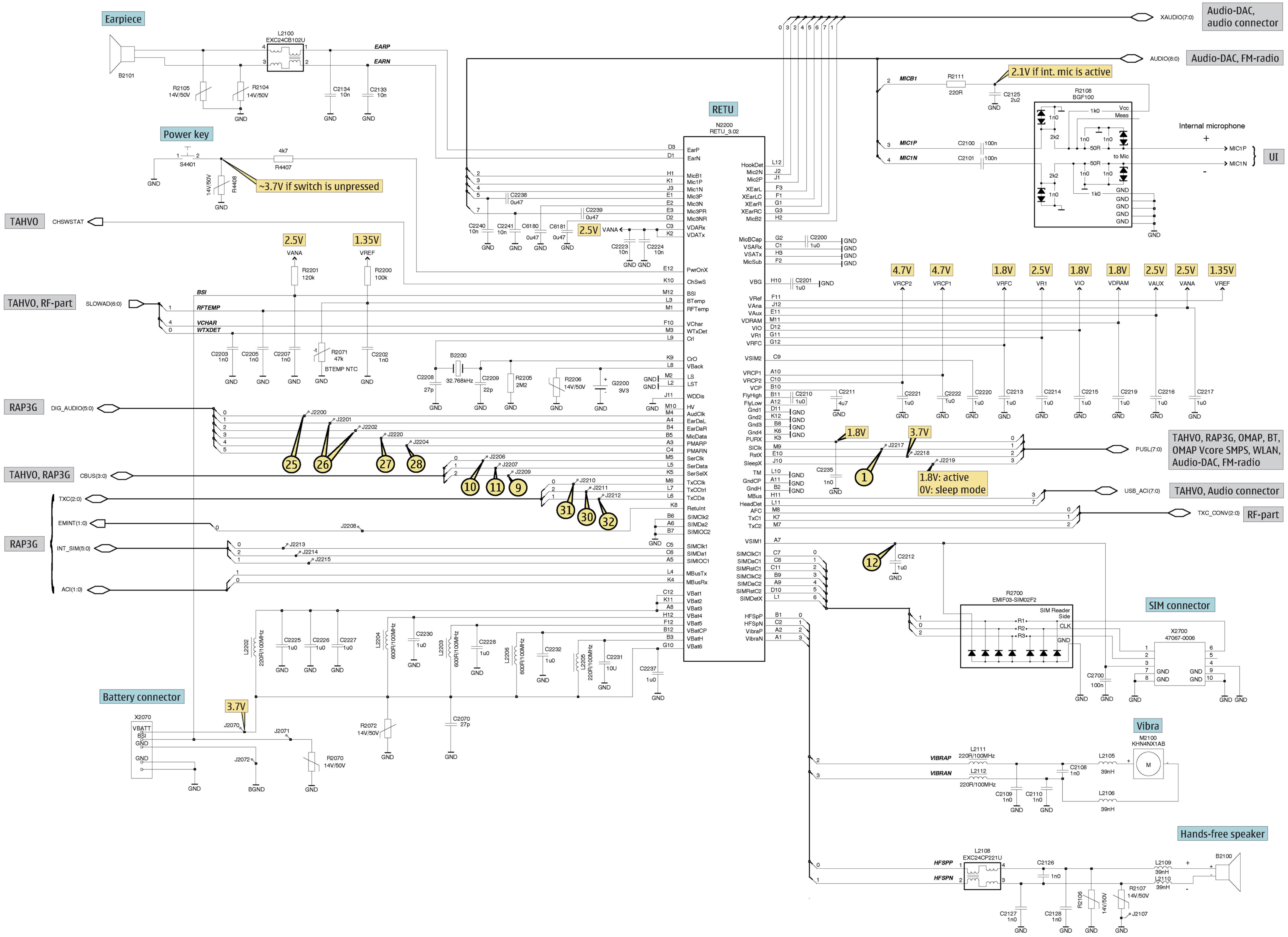
Table of Contents

System connector...10–4
EM ASIC N2200...10–5
EM ASIC N2300...10–6
RAP, memories...10–7
OMAP, camera, HDD...10–8
WLAN, Bluetooth...10–9
FM radio, audio DAC...10–10
RF part...10–11
User interface...10–12
Signal overview...10–13
Component finder...10–14

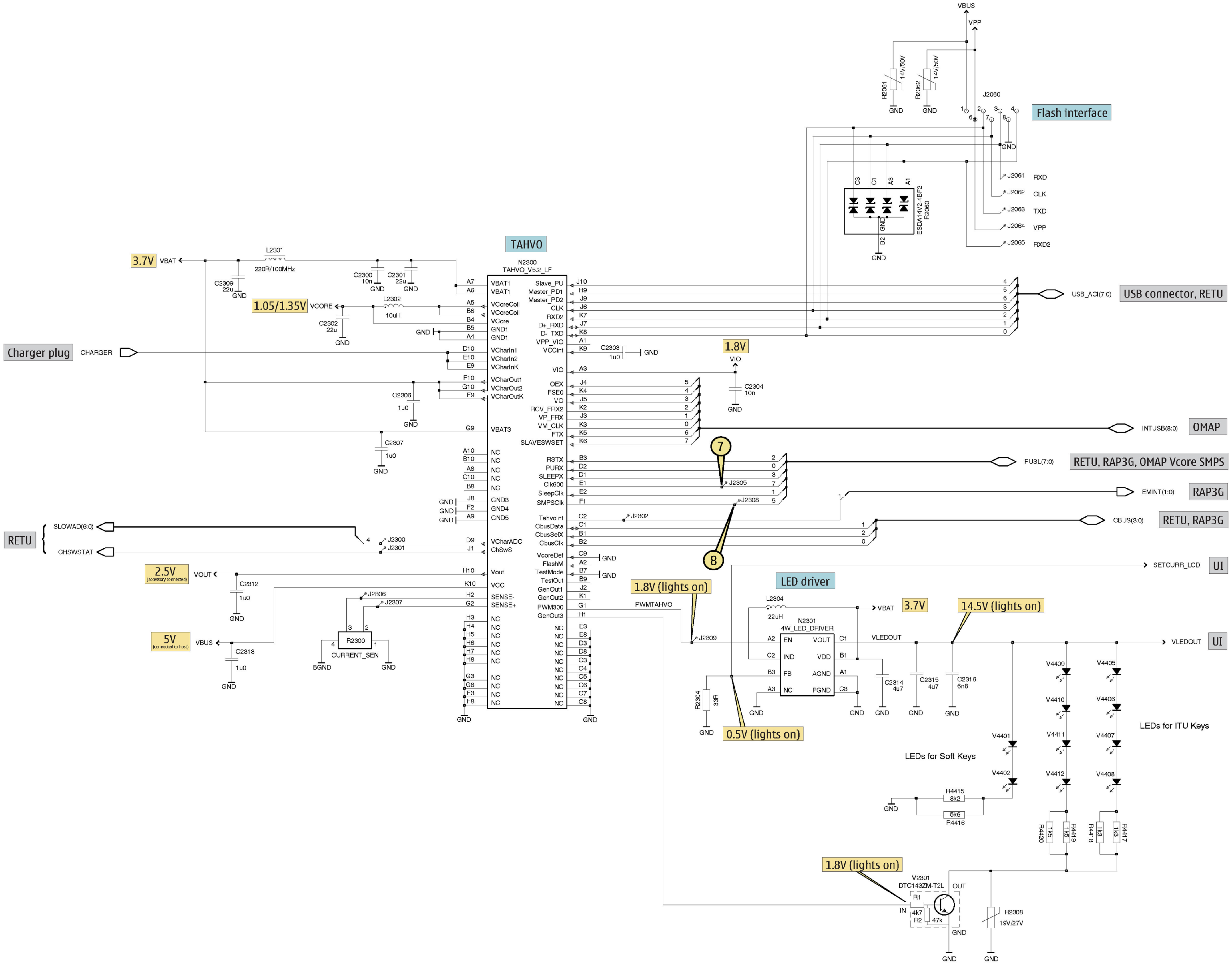
System connector


Charger plug
X2000
+
-
1
2
TAHVO
CHARGER
L2000
220R/100MHz
2A
F2000
1PMT16AT3
V2000
C2027
6n8
C2000
27p
C2012
470n
GND
RAP3G
GENIO(73:0)
48
61
1.8V if N2000 is active
R2024
100k
GND
Audio amplifier
N2000
TPA4411YZH
B2
B1
_SDL
_SDR
C1P
C1N
A4
C4
C2019
2u2
C1
A1
INL
INR
OUTR
OUTL
PVSS
SVSS
C2
D2
D4
D3
0R
R2031
0R
R2030
Audio-DAC
APE_AUDIOL
APE_AUDIOR
AIC33(3:0)
1u5
C2025
1u5
C2026
3V
VDAC
D1
A3
SVDD
PVDD
A2
B4
SGND
PGND
NC
NC
B3
C3
C2017
1u0
C2018
100n
GND
C2020
2u2
3
1
L2004
1000R/100MHz
L2005
1500R/100MHz
L2001
1500R/100MHz
L2002
1500R/100MHz
1.8V
VIO
R2023
100k
C2038
100n
Audio connector
X2002
1
3
5
4
2
6
7
8
9
47nH
L2010
47nH
L2011
L2007
1500R/100MHz
L2006
1500R/100MHz
L2003
1500R/100MHz
MIC+
ACI
MIC-
C2028
10n
C2029
10n
1/2 VWM16V
R2021
2/2 VWM16V
R2021
C2015
22p
C2016
22p
2.5V
VANA
R2019
120k
2.5V
(accessory connected)
VOUT
R2009
100R
C2011
1n0
2/2 VWM16V
R2022
1/2 VWM16V
R2022
FM-radio
FMANT
J2032
R2000
220R
2.1V if ext. mic is active
C2002
2u2
R2017
BGF100
Vcc
Meas
1k0
1n0
2k2
1n0
1n0
50R
to UEME
to Mic
50R
1n0
1n0
2k2
1n0
1k0
GND
RETU
XAUDIO(7:0)
0
1
2
3
HOOKDET
MICB2
MIC2P
MIC2N
C2003
100n
C2004
100n
L2008
1500R/100MHz
L2009
1500R/100MHz
C2036
10n
C2037
10n
RETU, TAHVO
USB_ACI(7:0)
4
1
0
6
5
7
SLAVEPU
DPRXD
DMTXD
MASTPD2
MASTPD1
ACI
13
220k
R2018
J2001
J2002
J2003
R2007
IP4065CX11_LF
17k
1k3
33R
33R
15k
GND
5V
(connected to host)
VBUS
Z2001
600R/100MHz
USB connector
X2001
1
2
3
4
5
Vbus
D-
D+
ID

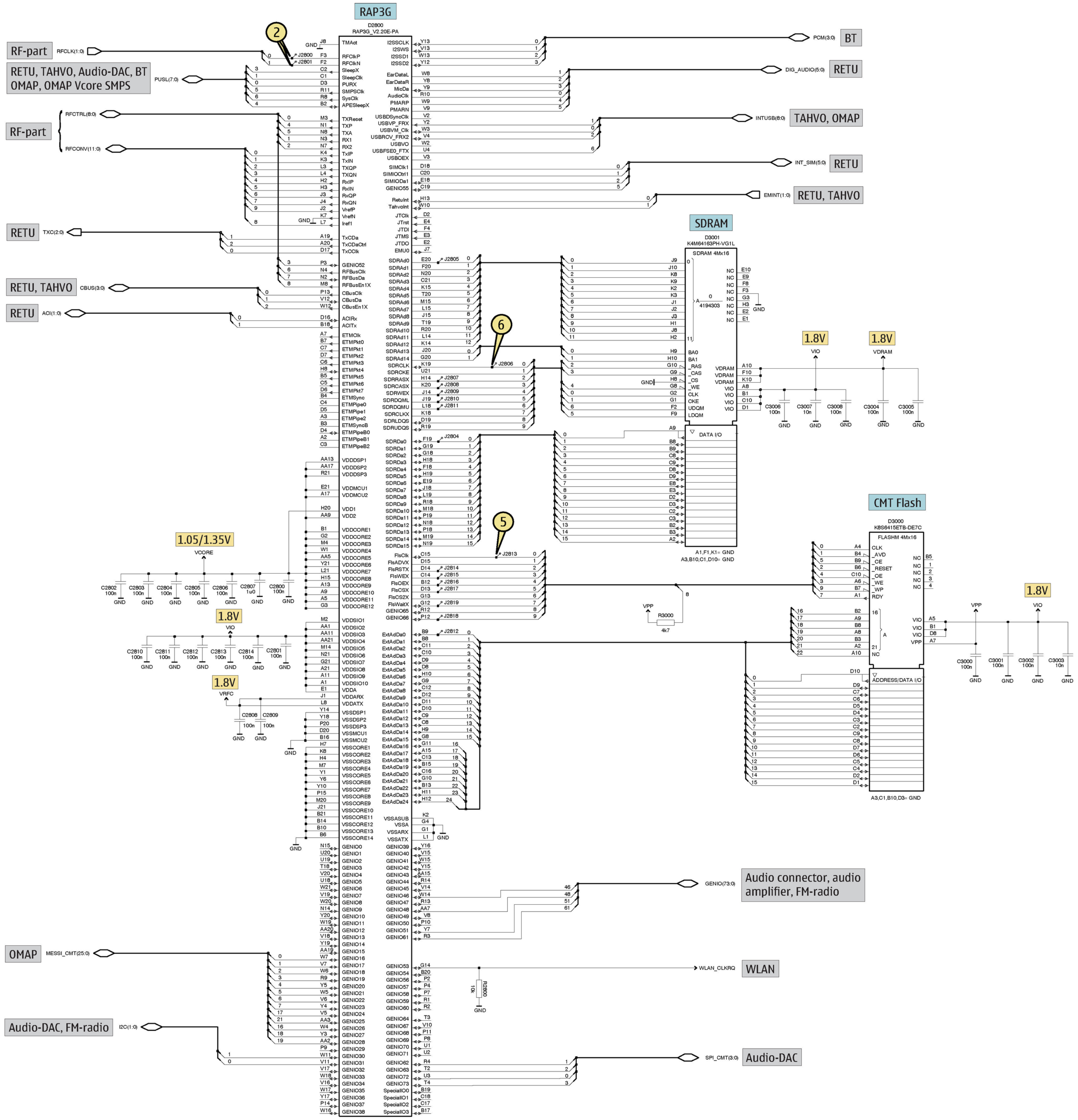
EM ASIC N2200


Earpiece
L2100 EXC24CB102U
EARP
EARN
B2101
R2105 14V/50V
R2104 14V/50V
C2134 10n
C2133 10n
GND
Power key
S4401
4k7 R4407
R4408 14V/50V
~3.7V if switch is unpressed
TAHVO
CHSWSTAT
TAHVO, RF-part
SLOWAD(6:0)
BSI
RFTEMP
VCHAR
WTXDET
2.5V
VANA
1.35V
VREF
R2201 120k
R2200 100k
R2071 47k BTEMP NTC
B2200 32.768kHz
R2205 2M2
R2206 14V/50V
C2200 3V3
RAP3G
DIG_AUDIO(5:0)
TAHVO, RAP3G
CBUS(3:0)
TXC(2:0)
EMINT(1:0)
INT_SIM(5:0)
ACI(1:0)
Battery connector
X2070
VBATT
BSI
GND
3.7V
J2070
J2071
J2072
R2070 14V/50V
R2072 14V/50V
C2070 27p
BGND
RETU
N2200 RETU_3.02
XAUDIO(7:0)
Audio-DAC, audio connector
AUDIO(8:0)
Audio-DAC, FM-radio
MICB1
R2111 220R
2.1V if int. mic is active
C2125 2u2
R2106 BGF100
MIC1P
MIC1N
C2100 100n
C2101 100n
Internal microphone
UI
4.7V
4.7V
1.8V
2.5V
1.8V
1.8V
2.5V
2.5V
1.35V
VRCP2
VRCP1
VRFC
VR1
VIO
VDRAM
VAUX
VANA
VREF
1.8V
3.7V
1.8V: active
0V: sleep mode
PUSL(7:0)
TAHVO, RAP3G, OMAP, BT, OMAP Vcore SMPS, WLAN, Audio-DAC, FM-radio
USB_ACI(7:0)
TAHVO, Audio connector
TXC_CONV(2:0)
RF-part
R2700 EMIF03-SIM02F2
SIM Reader Side
SIM connector
X2700 47067-0006
Vibra
M2100 KHN4NX1AB
VIBRAP
VIBRAN
L2111 220R/100MHz
L2112 220R/100MHz
L2105 39nH
L2106 39nH
Hands-free speaker
HFSPP
HFSPN
L2108 EXC24CP221U
B2100
L2109 39nH
L2110 39nH
R2107 14V/50V
①
⑨
⑩
⑪
⑫
㉕
㉖
㉗
㉘
㉛
(30)
(32)

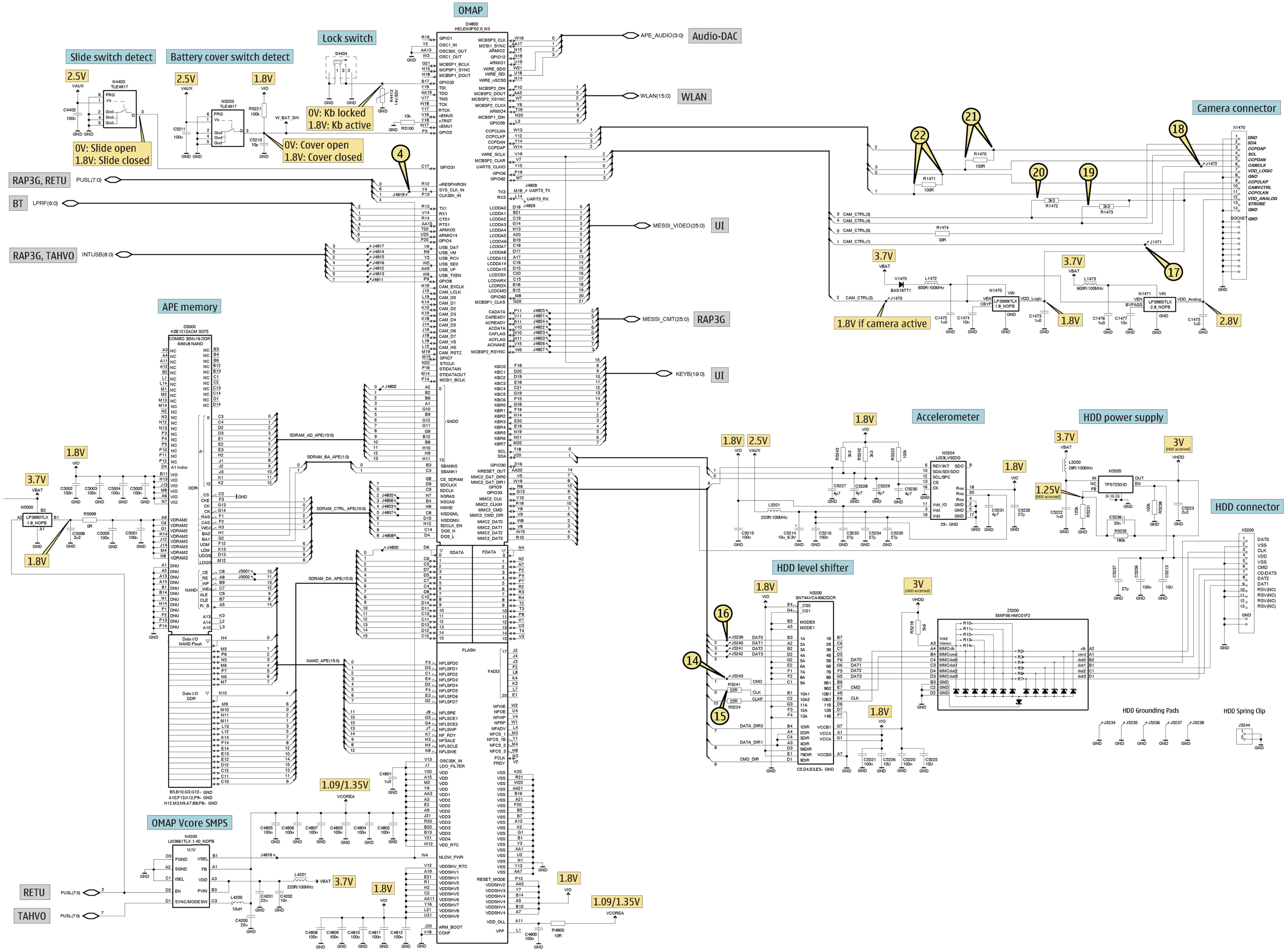
■ EM ASIC N2300


VBUS
VPP
R2061
14V/50V
R2062
14V/50V
J2060
Flash interface
J2061 RXD
J2062 CLK
J2063 TXD
J2064 VPP
J2065 RXD2
ESDA14V2-4BF2
R2060
TAHVO
N2300
TAHVO_V5.2_LF
3.7V
VBAT
L2301
220R/100MHz
C2309 22u
C2300 10n
C2301 22u
1.05/1.35V
VCORE
L2302
10uH
C2302 22u
Charger plug
CHARGER
C2306 1u0
C2307 1u0
USB_ACI(7:0)
USB connector, RETU
1.8V
VIO
C2303 1u0
C2304 10n
INTUSB(8:0)
OMAP
7
PUSL(7:0)
RETU, RAP3G, OMAP Vcore SMPS
J2305
J2308
EMINT(1:0)
RAP3G
J2302
CBUS(3:0)
RETU, RAP3G
SLOWAD(6:0)
RETU
CHSWSTAT
J2300
J2301
8
2.5V
(accessory connected)
VOUT
C2312 1u0
5V
(connected to host)
VBUS
C2313 1u0
J2306
J2307
R2300
CURRENT_SEN
BGND
SETCURR_LCD
UI
LED driver
1.8V (lights on)
PWMTAHVO
L2304 22uH
N2301
4W_LED_DRIVER
VBAT
3.7V
14.5V (lights on)
VLEDOUT
J2309
R2304 33R
0.5V (lights on)
C2314 4u7
C2315 4u7
C2316 6n8
LEDs for Soft Keys
LEDs for ITU Keys
R4415 8k2
R4416 5k6
R4420
R4419
R4418
R4417
1.8V (lights on)
V2301
DTC143ZM-T2L
R1 4k7
R2 47k
R2308
19V/27V
GND

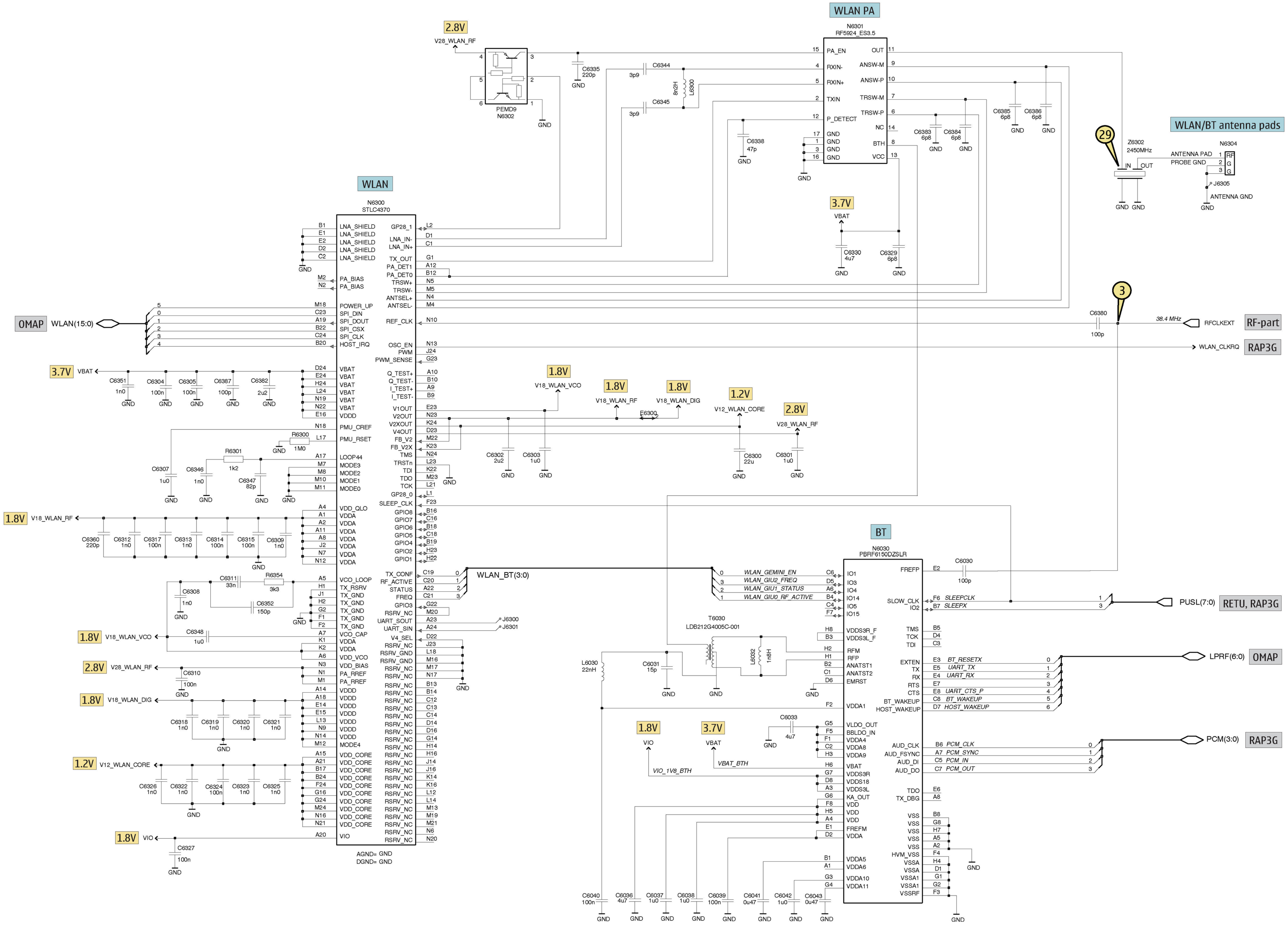
RAP, memories


RAP3G
D2800
RAP3G_V2.20E-PA
2
6
5
RF-part
RFCLK(1:0)
RETU, TAHVO, Audio-DAC, BT
OMAP, OMAP Vcore SMPS
PUSL(7:0)
RF-part
RFCTRL(8:0)
RFCONV(11:0)
RETU
TXC(2:0)
RETU, TAHVO
CBUS(3:0)
RETU
ACI(1:0)
1.05/1.35V
VCORE
1.8V
VIO
1.8V
VRFC
OMAP
MESSI_CMT(25:0)
Audio-DAC, FM-radio
I2C(1:0)
PCM(3:0)
BT
DIG_AUDIO(5:0)
RETU
INTUSB(6:0)
TAHVO, OMAP
INT_SIM(5:0)
RETU
EMINT(1:0)
RETU, TAHVO
SDRAM
D3001
K4M64163PH-VG1L
SDRAM 4Mx16
DATA I/O
A1,F1,K1= GND
A3,B10,C1,D10= GND
1.8V
VIO
1.8V
VDRAM
CMT Flash
D3000
K8S6415ETB-DE7C
FLASHM 4Mx16
ADDRESS/DATA I/O
A3,C1,B10,D3= GND
1.8V
VIO
VPP
R3000
4k7
GENIO(73:0)
Audio connector, audio amplifier, FM-radio
WLAN_CLKRQ
WLAN
R2800
10k
SPI_CMT(3:0)
Audio-DAC
GND

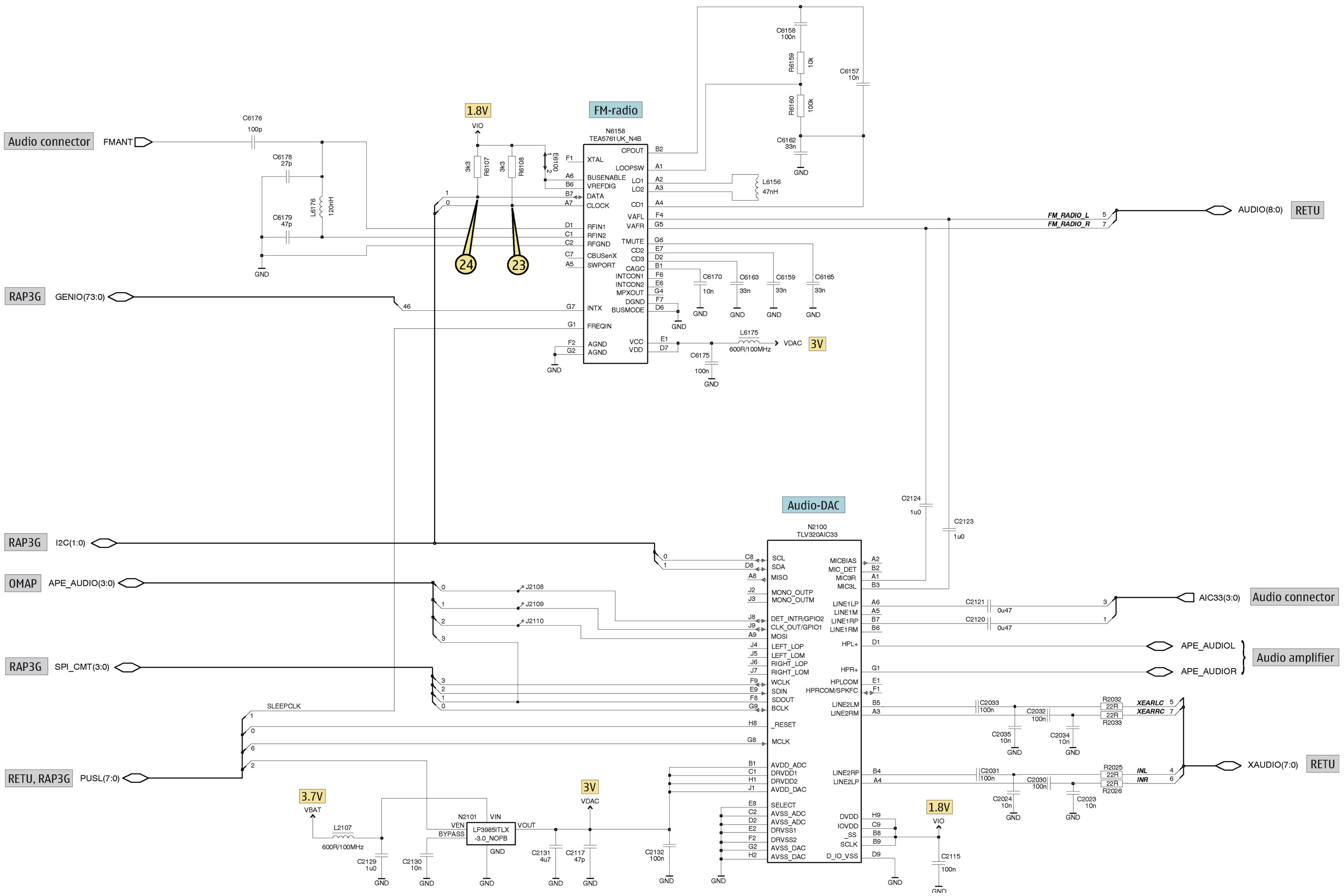
OMAP, camera, HDD


OMAP
D4800
HELEN3PS2.0_N3
Lock switch
Slide switch detect
Battery cover switch detect
2.5V
2.5V
1.8V
0V: Slide open
1.8V: Slide closed
0V: Cover open
1.8V: Cover closed
0V: Kb locked
1.8V: Kb active
Audio-DAC
APE_AUDIO(3:0)
WLAN
WLAN(15:0)
Camera connector
X1470
RAP3G, RETU
PUSL(7:0)
BT
LPRF(6:0)
RAP3G, TAHVO
INTUSB(8:0)
UI
MESSI_VIDEO(25:0)
RAP3G
MESSI_CMT(25:0)
UI
KEYB(19:0)
APE memory
D5000
3.7V
1.8V
1.8V
3.7V
3.7V
1.8V if camera active
1.8V
2.8V
Accelerometer
N5204
HDD power supply
3.7V
3V
1.25V
HDD connector
X5200
HDD level shifter
N5200
1.8V
3V
1.8V
1.8V
2.5V
1.8V
HDD Grounding Pads
HDD Spring Clip
1.09/1.35V
OMAP Vcore SMPS
N4200
3.7V
1.8V
1.8V
1.09/1.35V
RETU
TAHVO
4
14
15
16
17
18
19
20
21
22

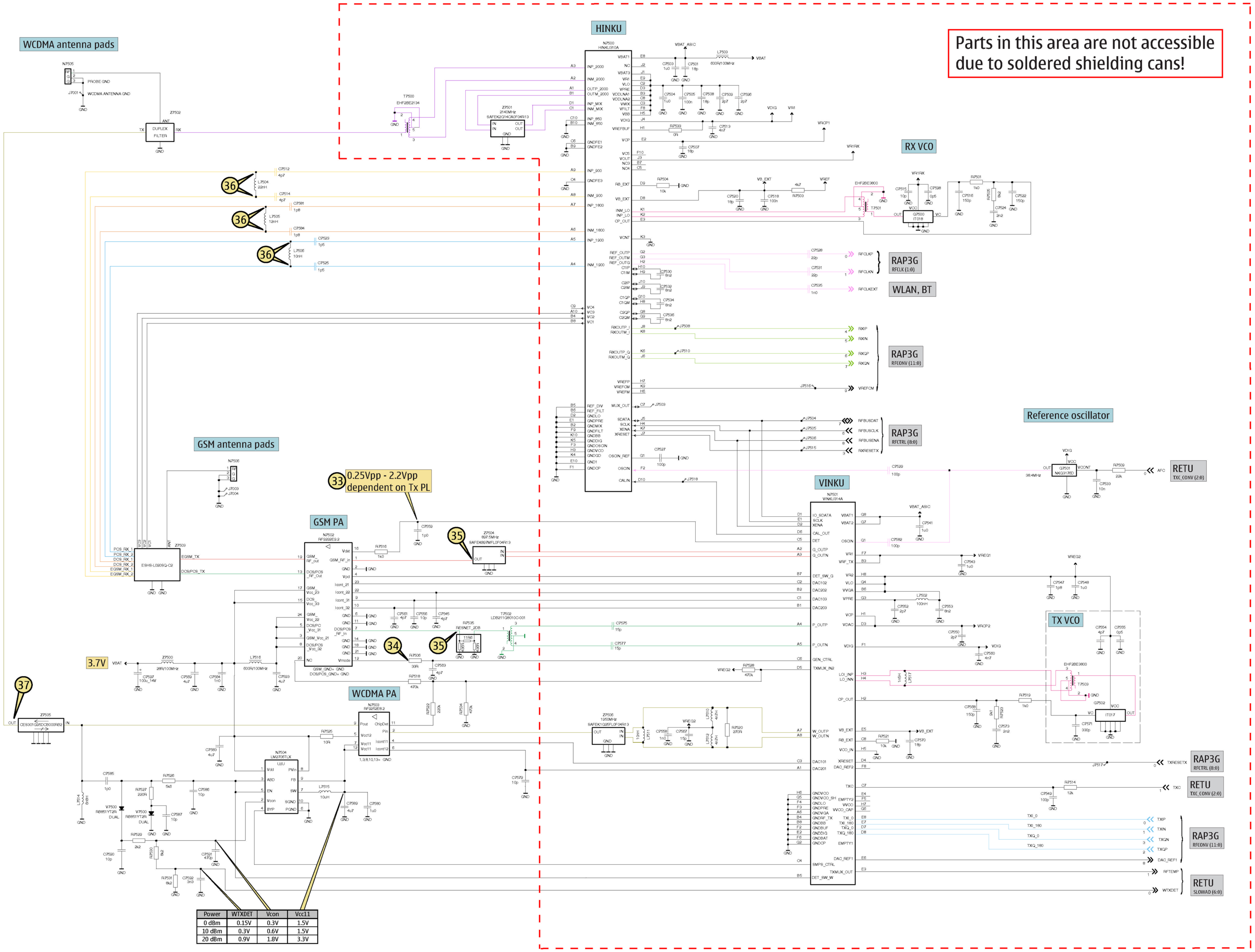
WLAN, Bluetooth


WLAN PA
N6301
RF5924_ES3.5
2.8V
V28_WLAN_RF
PEMD9
N6302
C6335
220p
C6344
3p9
C6345
3p9
L6300
8n2H
C6338
47p
PA_EN
RXIN-
RXIN+
TXIN
P_DETECT
OUT
ANSW-M
ANSW-P
TRSW-M
TRSW-P
NC
BTH
VCC
C6383
6p8
C6384
6p8
C6385
6p8
C6386
6p8
WLAN/BT antenna pads
29
Z6302
2450MHz
IN
OUT
N6304
ANTENNA PAD
PROBE GND
RF
J6305
ANTENNA GND
3.7V
VBAT
C6330
4u7
C6329
6p8
WLAN
N6300
STLC4370
LNA_SHIELD
GP28_1
LNA_IN-
LNA_IN+
TX_OUT
PA_DET1
PA_DET0
TRSW+
TRSW-
ANTSEL+
ANTSEL-
PA_BIAS
POWER_UP
SPI_DIN
SPI_DOUT
SPI_CSX
SPI_CLK
HOST_IRQ
REF_CLK
OSC_EN
PWM
PWM_SENSE
OMAP
WLAN(15:0)
3
C6380
100p
38.4 MHz
RFCLKEXT
RF-part
WLAN_CLKRQ
RAP3G
3.7V
VBAT
C6351
1n0
C6304
100n
C6305
100n
C6387
100p
C6382
2u2
VDDO
PMU_CREF
PMU_RSET
R6300
1M0
Q_TEST+
Q_TEST-
I_TEST+
I_TEST-
V1OUT
V2OUT
V2XOUT
V4OUT
FB_V2
FB_V2X
1.8V
V18_WLAN_VCO
V18_WLAN_RF
V18_WLAN_DIG
1.2V
V12_WLAN_CORE
2.8V
V28_WLAN_RF
E6300
C6302
2u2
C6303
1u0
C6300
22u
C6301
1u0
R6301
1k2
C6307
1u0
C6346
1n0
C6347
82p
LOOP44
MODE3
MODE2
MODE1
MODE0
TMS
TRSTn
TDI
TDO
TCK
GP28_0
SLEEP_CLK
GPIO8
GPIO7
GPIO6
GPIO5
GPIO4
GPIO2
GPIO1
1.8V
V18_WLAN_RF
VDD_QLO
VDDA
C6360
220p
C6312
1n0
C6317
100n
C6313
1n0
C6314
100n
C6315
100n
C6309
1n0
TX_CONF
RF_ACTIVE
STATUS
FREQ
WLAN_BT(3:0)
C6311
33n
R6354
3k3
C6308
1n0
C6352
150p
VCO_LOOP
TX_RSRV
TX_GND
VCO_CAP
1.8V
V18_WLAN_VCO
C6348
1u0
VDD_VCO
VDD_BIAS
PA_RREF
2.8V
V28_WLAN_RF
C6310
100n
UART_SOUT
UART_SIN
J6300
J6301
V4_SEL
RSRV_GND
RSRV_NC
1.8V
V18_WLAN_DIG
VDDD
C6318
1n0
C6319
1n0
C6320
1n0
C6321
1n0
MODE4
1.2V
V12_WLAN_CORE
VDD_CORE
C6326
1n0
C6322
1n0
C6324
100n
C6323
1n0
C6325
1n0
1.8V
VIO
C6327
100n
AGND= GND
DGND= GND
BT
N6030
PBRF6150DZSLR
WLAN_GEMINI_EN
WLAN_GIU2_FREQ
WLAN_GIU1_STATUS
WLAN_GIU0_RF_ACTIVE
IO1
IO3
IO4
IO14
IO5
IO15
FREFP
C6030
100p
SLOW_CLK
IO2
SLEEPCLK
SLEEPX
PUSL(7:0)
RETU, RAP3G
T6030
LDB212G4005C-001
L6030
22nH
C6031
15p
L6032
1n8H
VDDS3R_F
VDDS3L_F
RFM
RFP
ANATST1
ANATST2
EMRST
TMS
TCK
TDI
EXTEN
TX
RX
RTS
CTS
BT_WAKEUP
HOST_WAKEUP
BT_RESETX
UART_TX
UART_RX
UART_CTS_P
BT_WAKEUP
HOST_WAKEUP
LPRF(6:0)
OMAP
VDDA1
1.8V
VIO
3.7V
VBAT
C6033
4u7
VLDO_OUT
BBLDO_IN
VDDA4
VDDA8
VDDA9
VIO_1V8_BTH
VBAT_BTH
VBAT
VDDS3R
VDDS18
VDDS3L
KA_OUT
VDD
FREFM
VDDA
AUD_CLK
AUD_FSYNC
AUD_DI
AUD_DO
PCM_CLK
PCM_SYNC
PCM_IN
PCM_OUT
PCM(3:0)
RAP3G
TDO
TX_DBG
VSS
HVM_VSS
VSSA
VSSA1
VSSRF
VDDA5
VDDA6
VDDA10
VDDA11
C6040
100n
C6036
4u7
C6037
1u0
C6038
1u0
C6039
100n
C6041
0u47
C6042
1u0
C6043
0u47
GND

FM radio, audio DAC

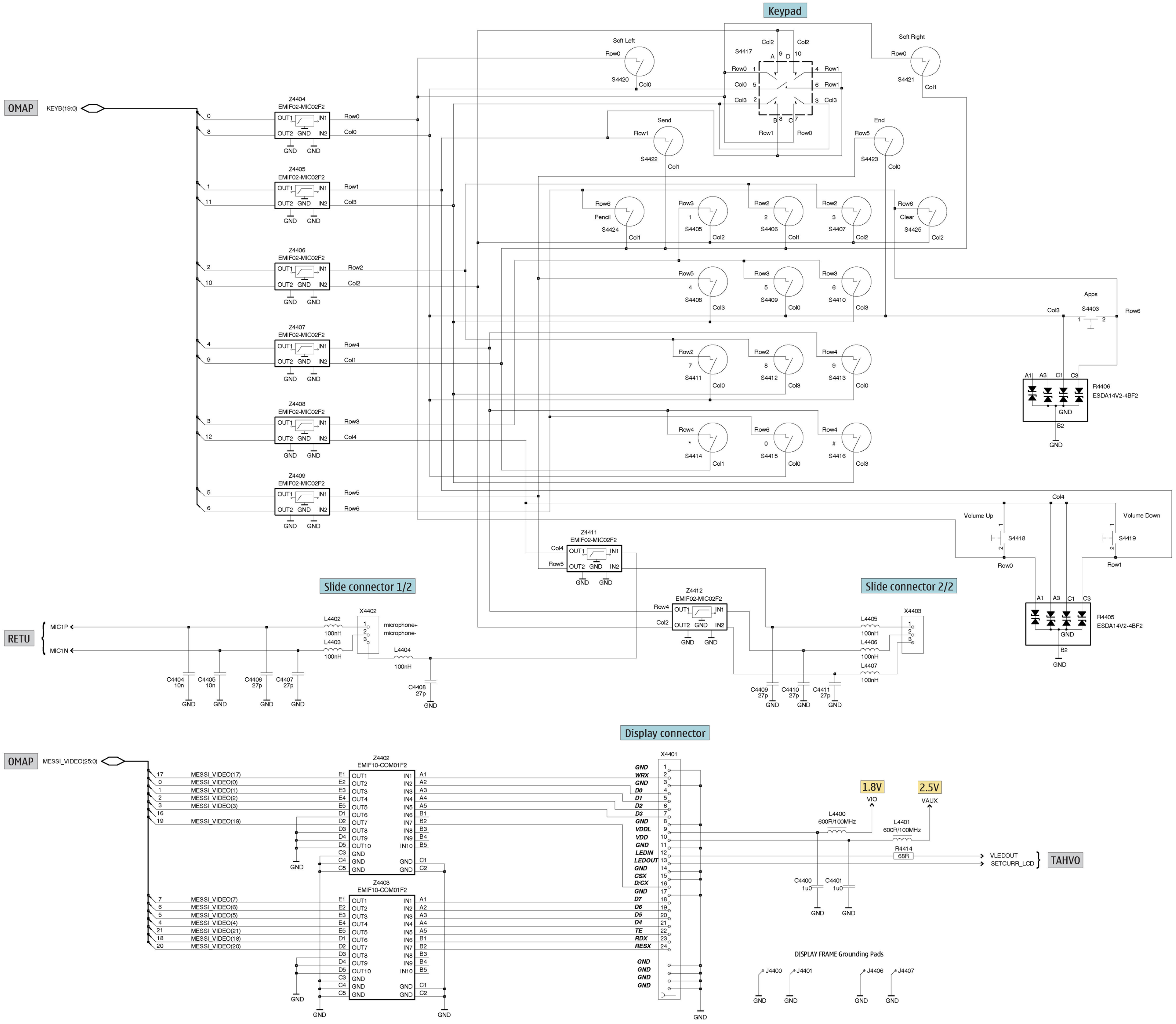

Audio connector
FMANT
C6176 100p
C6178 27p
C6179 47p
L6176 120nH
GND
1.8V
VIO
3k3 R6107
3k3 R6108
E6100
FM-radio
N6158
TEA5761UK_N4B
XTAL
BUSENABLE
VREFDIG
DATA
CLOCK
RFIN1
RFIN2
RFGND
CBUSenX
SWPORT
INTX
FREQIN
AGND
AGND
CPOUT
LOOPSW
LO1
LO2
CD1
VAFL
VAFR
TMUTE
CD2
CD3
CAGC
INTCON1
INTCON2
MPXOUT
DGND
BUSMODE
VCC
VDD
C6158 100n
R6159 10k
R6160 100k
C6157 10n
C6162 33n
L6156 47nH
C6170 10n
C6163 33n
C6159 33n
C6165 33n
L6175 600R/100MHz
C6175 100n
VDAC
3V
24
23
RAP3G
GENIO(73:0)
46
FM_RADIO_L
FM_RADIO_R
AUDIO(8:0)
RETU
C2124 1u0
C2123 1u0
Audio-DAC
N2100
TLV320AIC33
RAP3G
I2C(1:0)
OMAP
APE_AUDIO(3:0)
J2108
J2109
J2110
RAP3G
SPI_CMT(3:0)
SLEEPCLK
RETU, RAP3G
PUSL(7:0)
SCL
SDA
MISO
MONO_OUTP
MONO_OUTM
DET_INTR/GPIO2
CLK_OUT/GPIO1
MOSI
LEFT_LOP
LEFT_LOM
RIGHT_LOP
RIGHT_LOM
WCLK
SDIN
SDOUT
BCLK
_RESET
MCLK
AVDD_ADC
DRVDD1
DRVDD2
AVDD_DAC
SELECT
AVSS_ADC
AVSS_ADC
DRVSS1
DRVSS2
AVSS_DAC
AVSS_DAC
MICBIAS
MIC_DET
MIC3R
MIC3L
LINE1LP
LINE1M
LINE1RP
LINE1RM
HPL+
HPR+
HPLCOM
HPRCOM/SPKFC
LINE2LM
LINE2RM
LINE2RP
LINE2LP
DVDD
IOVDD
_SS
SCLK
D_IO_VSS
C2121 0u47
C2120 0u47
AIC33(3:0)
Audio connector
APE_AUDIOL
APE_AUDIOR
Audio amplifier
C2033 100n
C2032 100n
C2035 10n
C2034 10n
R2032 22R
R2033 22R
XEARLC
XEARRC
C2031 100n
C2030 100n
C2024 10n
C2023 10n
R2025 22R
R2026 22R
INL
INR
XAUDIO(7:0)
RETU
3.7V
VBAT
L2107 600R/100MHz
C2129 1u0
C2130 10n
N2101
LP3985ITLX -3.0_NOPB
VEN
BYPASS
VIN
VOUT
GND
3V
VDAC
C2131 4u7
C2117 47p
C2132 100n
1.8V
VIO
C2115 100n

RF part


Parts in this area are not accessible due to soldered shielding cans!
WCDMA antenna pads
HINKU
RX VCO
RAP3G
WLAN, BT
Reference oscillator
RETU
GSM antenna pads
0.25Vpp - 2.2Vpp dependent on Tx PL
GSM PA
VINKU
TX VCO
3.7V
WCDMA PA
DUPLEX FILTER
33
34
35
36
37

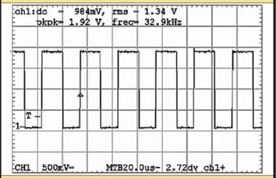
Power	WTXDET	Vcon	Vcc11
0 dBm	0.15V	0.3V	1.5V
10 dBm	0.3V	0.6V	1.5V
20 dBm	0.9V	1.8V	3.3V

User interface

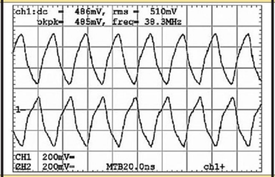

Keypad
OMAP
KEYB(19:0)
Z4404 EMIF02-MIC02F2
Z4405 EMIF02-MIC02F2
Z4406 EMIF02-MIC02F2
Z4407 EMIF02-MIC02F2
Z4408 EMIF02-MIC02F2
Z4409 EMIF02-MIC02F2
Soft Left
S4420
S4417
Soft Right
S4421
Send
S4422
End
S4423
Pencil
S4424
S4405
S4406
S4407
Clear
S4425
S4408
S4409
S4410
Apps
S4403
S4411
S4412
S4413
S4414
S4415
S4416
R4406 ESDA14V2-4BF2
Volume Up
S4418
Volume Down
S4419
R4405 ESDA14V2-4BF2
Z4411 EMIF02-MIC02F2
Z4412 EMIF02-MIC02F2
Slide connector 1/2
Slide connector 2/2
RETU
MIC1P
MIC1N
X4402
microphone+
microphone-
L4402 100nH
L4403 100nH
L4404 100nH
C4404 10n
C4405 10n
C4406 27p
C4407 27p
C4408 27p
X4403
L4405 100nH
L4406 100nH
L4407 100nH
C4409 27p
C4410 27p
C4411 27p
Display connector
OMAP
MESSI_VIDEO(25:0)
Z4402 EMIF10-COM01F2
Z4403 EMIF10-COM01F2
X4401
1.8V
VIO
2.5V
VAUX
L4400 600R/100MHz
L4401 600R/100MHz
R4414 68R
C4400 1u0
C4401 1u0
VLEDOUT
SETCURR_LCD
TAHVO
DISPLAY FRAME Grounding Pads
J4400
J4401
J4406
J4407
GND

Signal overview

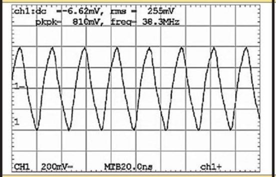
1) Sleepclock at J2217



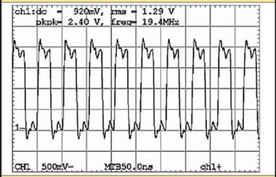
2) RFClk at J2800/J2801



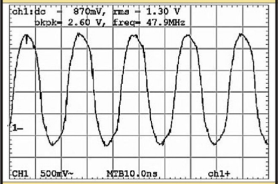
3) RFCLKEXT at C6380



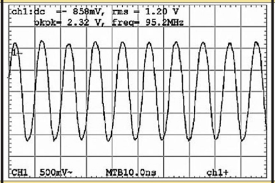
4) SysClkIn at J4819



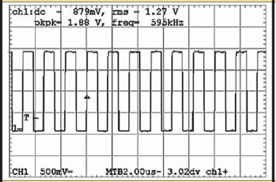
5) FlsClk at J2813



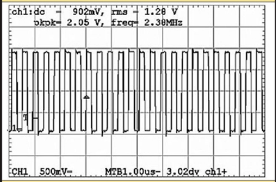
6) SDRCLK at J2806



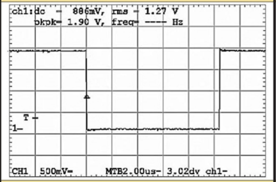
7) Clk600 at J2305



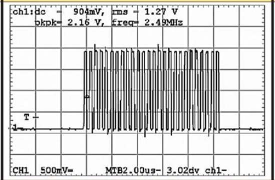
8) SMPSClk at J2308



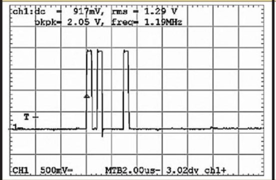
9) SerSelX at J2209



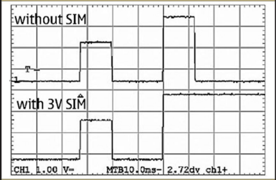
10) SerClk at J2206



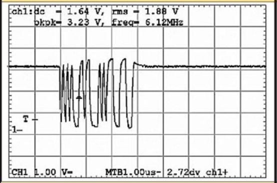
11) SerData at J2207



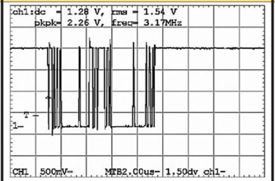
12) VSIM at C2212



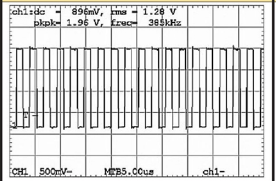
13) DPRXD at R2018



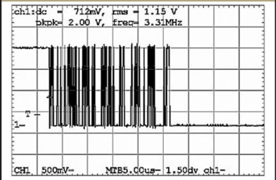
14) HDD CMD at J5243



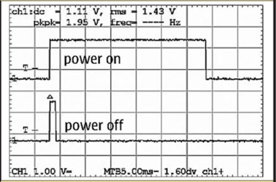
15) HDD CLK at R5241



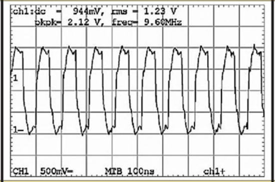
16) HDD DAT0 at J5239



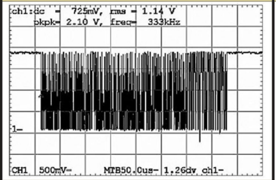
17) CAMVCTRL at J1471



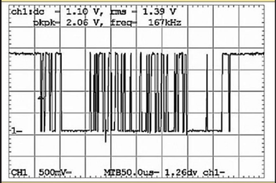
18) CAMCLK at J1472



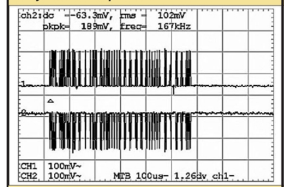
19) CAMSCL at R1473



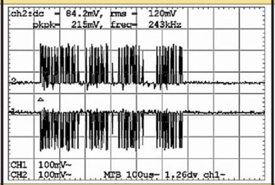
20) CAMSDA at R1472



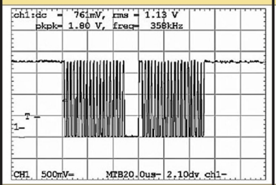
21) CCPDAP/N at R1470



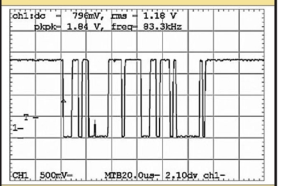
22) CCPCLKP/N at R1471



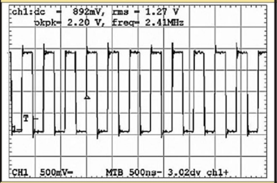
23) I2C Clock at R6108



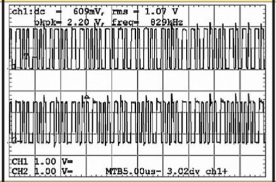
24) I2C Data at R6107



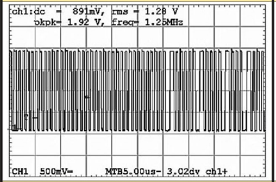
25) AudClk at J2200



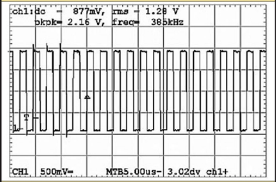
26) EarData at J2201/J2202



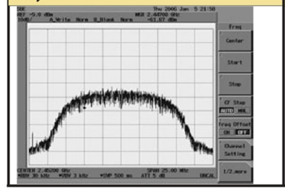
27) MicData at J2220



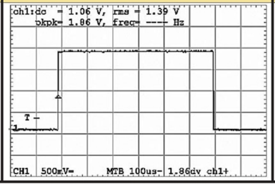
28) PMARP at 2204



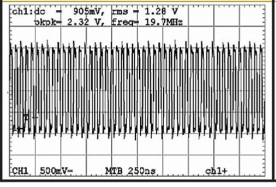
29) WLAN TX at Z6302



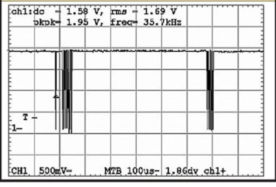
30) TxCCtrl at J2211



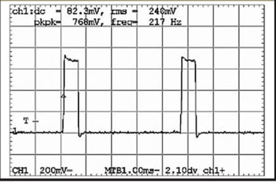
31) TxCClk at J2210



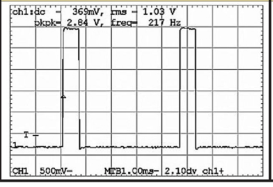
32) TxCData at J2212



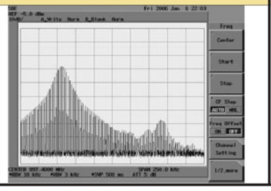
33) VDET at C7559



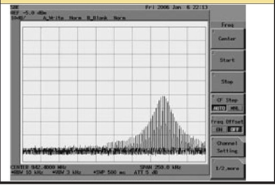
34) Vmode at R7506 (Edge on)



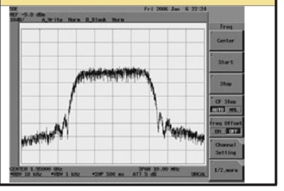
35) GSM900 TX at Z7504

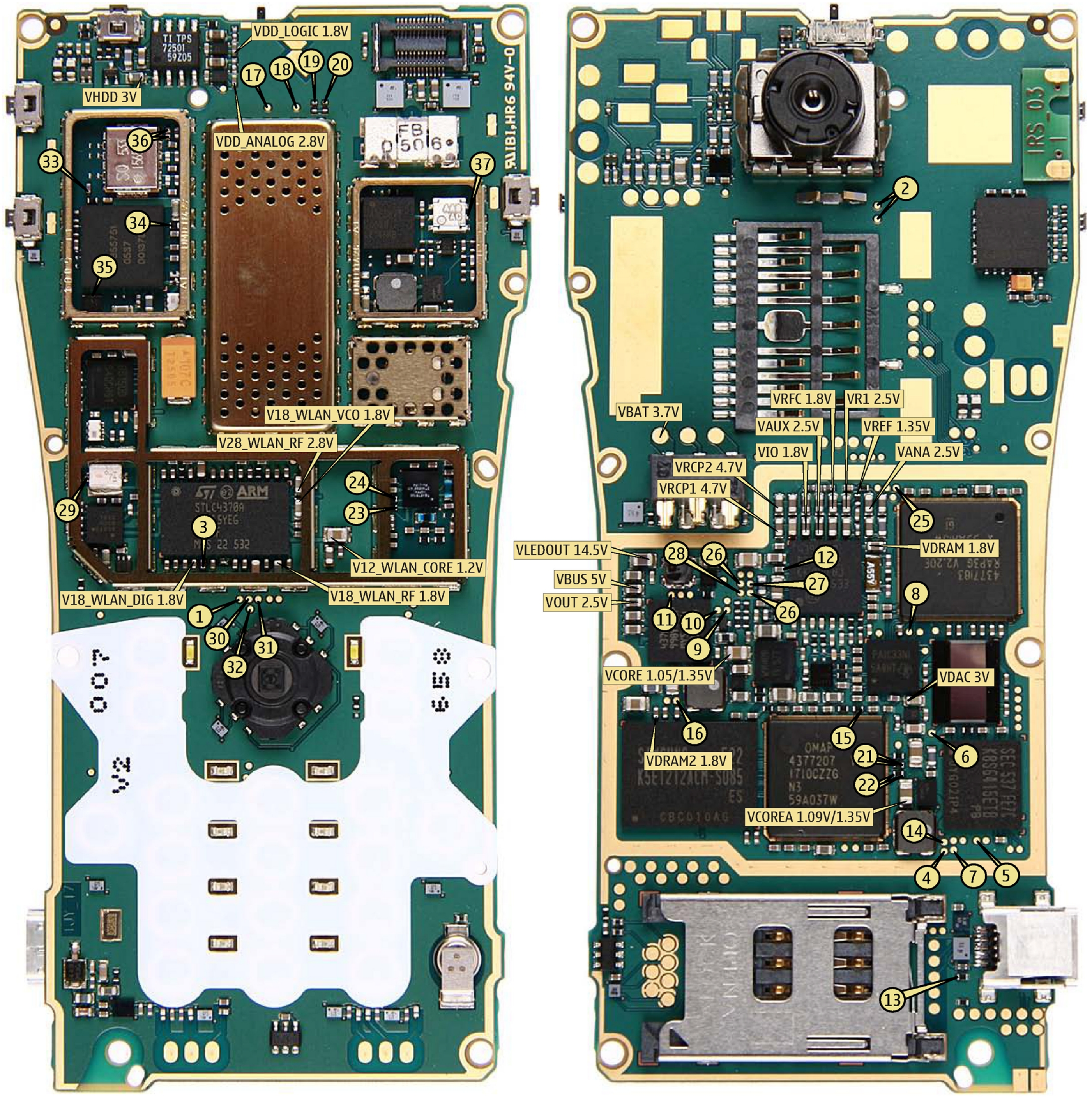


36) GSM900 RX at L7504



37) WCDMA TX at Z7505





Component finder

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B2200	E11	C2302	H9	C6030	B15	C7535	F18	J2214	F10	J5234	D17	N2300	I10	R7503	G15
C		C2303	J11	C6031	C14	C7536	G18	J2215	C10	J5235	J17	N2301	H11	R7504	G19
C1472	E22	C2304	H9	C6033	C15	C7541	G16	J2217	E10	J5236	D14	N4200	D7	R7505	E17
C1473	E21	C2306	J10	C6036	C14	C7543	F16	J2218	D6	J5237	J15	N4400	F2	R7506	D18
C1474	E21	C2307	J10	C6037	D14	C7545	B17	J2219	C13	J5238	J16	N5000	H9	R7509	G16
C1475	E21	C2309	J8	C6038	C15	C7547	G16	J2220	H11	J5239	I8	N5200	G9	R7514	F16
C1476	E21	C2312	J10	C6039	B14	C7548	G16	J2300	G13	J5240	I8	N5203	J4	R7516	C18
C1477	E21	C2313	J11	C6040	B14	C7549	F16	J2301	H11	J5241	E8	N5204	B18	R7518	B18
C2000	C3	C2314	H11	C6041	C15	C7550	G14	J2302	H10	J5242	F6	N5205	D21	R7519	G14
C2002	I19	C2315	J11	C6042	C14	C7552	F14	J2305	D5	J5243	D6	N6030	C15	R7520	E15
C2003	H19	C2316	I11	C6043	C14	C7553	F14	J2306	H12	J6300	G13	N6158	I13	R7521	F16
C2004	H19	C2700	D4	C6157	I12	C7554	J15	J2307	H11	J6301	G13	N6300	E12	R7522	H18
C2011	H20	C2800	C10	C6158	I12	C7555	J15	J2308	D10	J6305	C16	N6301	C12	R7523	G14
C2012	C3	C2801	C12	C6159	H13	C7556	D17	J2309	H11	J7001	K21	N6302	C11	R7525	J16
C2015	J19	C2802	C10	C6162	I12	C7558	F16	J2800	E18	J7003	B21	N7500	F18	R7526	I17
C2016	J19	C2803	E10	C6163	I13	C7559	C18	J2801	E18	J7004	E21	N7501	F15	R7527	I17
C2017	F9	C2804	C10	C6165	I13	C7560	F14	J2804	C9	J7503	G19	N7502	C17	R7528	G15
C2018	F9	C2805	D12	C6170	J12	C7561	D17	J2805	B8	J7504	F14	N7503	H18	R7529	J17
C2019	F8	C2806	B12	C6175	H13	C7563	D18	J2806	D8	J7505	F14	N7504	I16	R7530	J17
C2020	F8	C2807	C12	C6176	J13	C7564	C18	J2807	B9	J7506	F14	**R**		R7531	J17
C2023	F10	C2808	D12	C6178	J13	C7567	E15	J2808	B8	J7508	G17	R1470	E7	R7533	F17
C2024	F10	C2809	C12	C6179	J12	C7568	G14	J2809	B8	J7510	F17	R1471	E7	R7534	B18
C2025	F9	C2810	E10	C6180	G10	C7569	D18	J2810	B8	J7515	F17	R1472	G20	R7535	D17
C2026	F9	C2811	D12	C6181	G10	C7570	G15	J2811	D10	J7516	G18	R1473	G20	**S**	
C2027	C3	C2812	D10	C6300	G12	C7571	J14	J2812	B6	J7517	F14	R1474	E7	S4401	C22
C2028	J19	C2813	C10	C6301	G13	C7573	G14	J2813	C6	J7518	G18	R2000	I19	S4403	K18
C2029	J19	C2814	C10	C6302	F11	C7575	E15	J2814	C6	**L**		R2007	C4	S4404	F22
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C2033	F10	C3003	C6	C6307	F11	C7581	D19	J2818	C7	L2001	J19	R2019	H20	**T**	
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C2035	F10	C3005	C9	C6309	D13	C7583	I16	J3100	D14	L2003	H21	R2022	H20	T7500	F19
C2036	H19	C3006	D9	C6310	D11	C7584	D19	J3101	C14	L2004	I19	R2023	J21	T7501	E17
C2037	H19	C3007	C8	C6311	D13	C7585	I18	J3102	D16	L2005	I19	R2024	F9	T7502	D16
C2038	J21	C3008	D9	C6312	D11	C7586	I17	J3103	D16	L2006	H21	R2025	F10	T7503	H15
C2070	I12	C4200	E7	C6313	D13	C7587	I17	J3104	D16	L2007	J22	R2026	F10	**V**	
C2100	C3	C4201	D7	C6314	D11	C7589	H16	J3105	D16	L2008	H19	R2030	F9	V1470	C21
C2101	C2	C4202	D7	C6315	E13	C7590	J17	J3106	D15	L2009	H19	R2031	F9	V2000	B3
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C2110	G10	C4402	F2	C6319	E11	C7593	C16	J3109	I5	L2100	G22	R2060	J3	V4402	E9
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C2117	E8	C4405	D2	C6321	E11	C7597	D15	J3111	I5	L2106	C14	R2062	J4	V4406	E7
C2120	E9	C4406	D2	C6322	G12	C7598	G16	J3112	I5	L2107	E8	R2070	H12	V4407	E5
C2121	E9	C4407	D2	C6323	F13	**D**		J3113	I5	L2108	B21	R2071	H12	V4408	G5
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C2240	H11	C5234	B16	C7531	E18	J2210	F10	J5108	B2	N2000	F9	R6300	E11		
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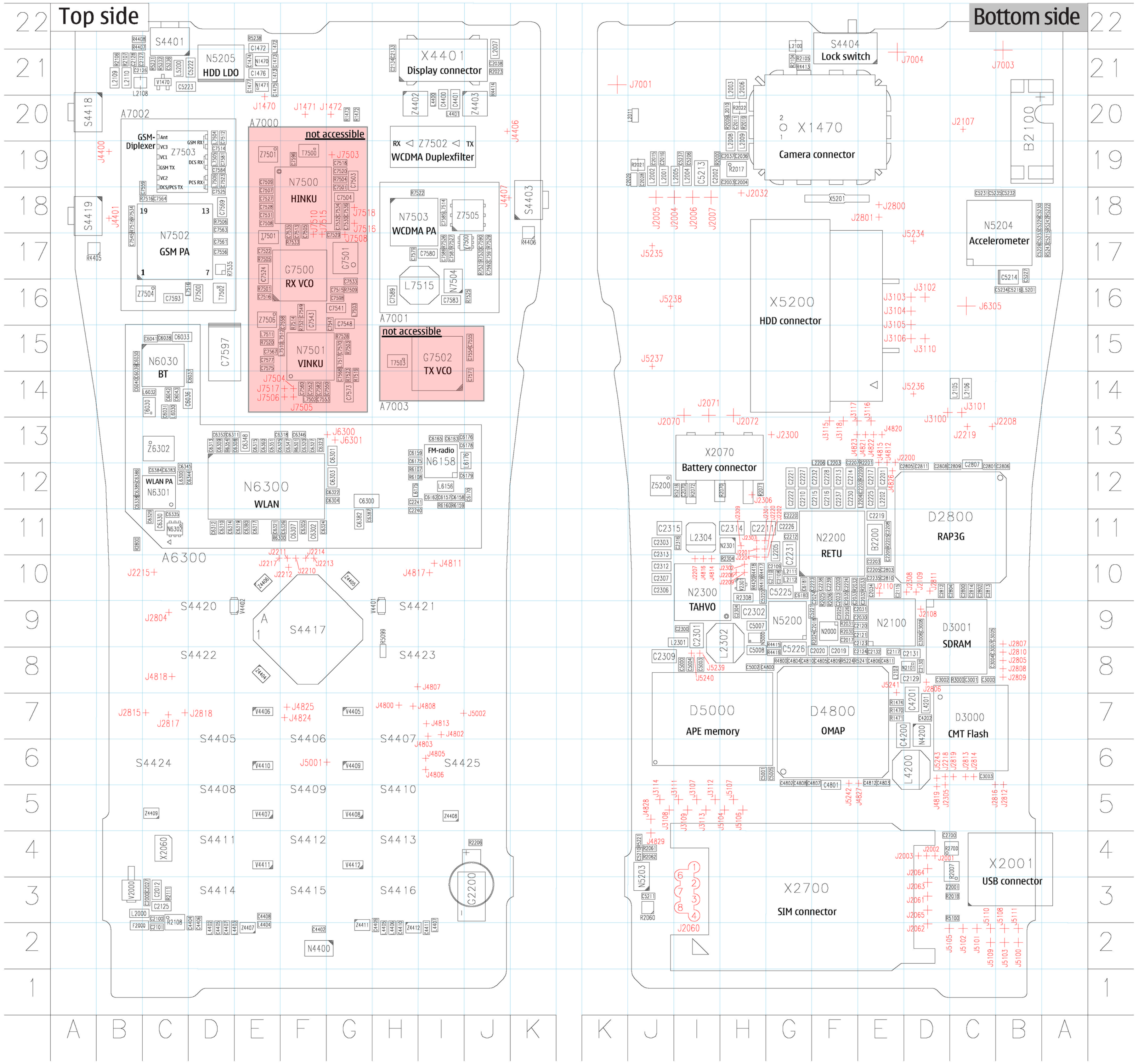
Top side
Bottom side
not accessible
not accessible
S4401
N5205
HDD LDO
X4401
Display connector
A7002
A7000
GSM-Diplexer
Z7503
N7500
HINKU
N7502
GSM PA
G7500
RX VCO
N7501
VINKU
RX Z7502 TX
WCDMA Duplexfilter
N7503
WCDMA PA
Z7505
L7515
A7001
G7502
TX VCO
A7003
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BT
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WLAN
WLAN PA
N6301
FM-radio
N6158
A6300
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S4414
S4415
S4416
G2200
N4400
X2060
S4404
Lock switch
X1470
Camera connector
B2100
N5204
Accelerometer
X5200
HDD connector
X2070
Battery connector
D2800
RAP3G
N2200
RETU
N2300
TAHVO
N5200
N2100
D3001
SDRAM
D5000
APE memory
D4800
OMAP
D3000
CMT Flash
X2001
USB connector
X2700
SIM connector
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